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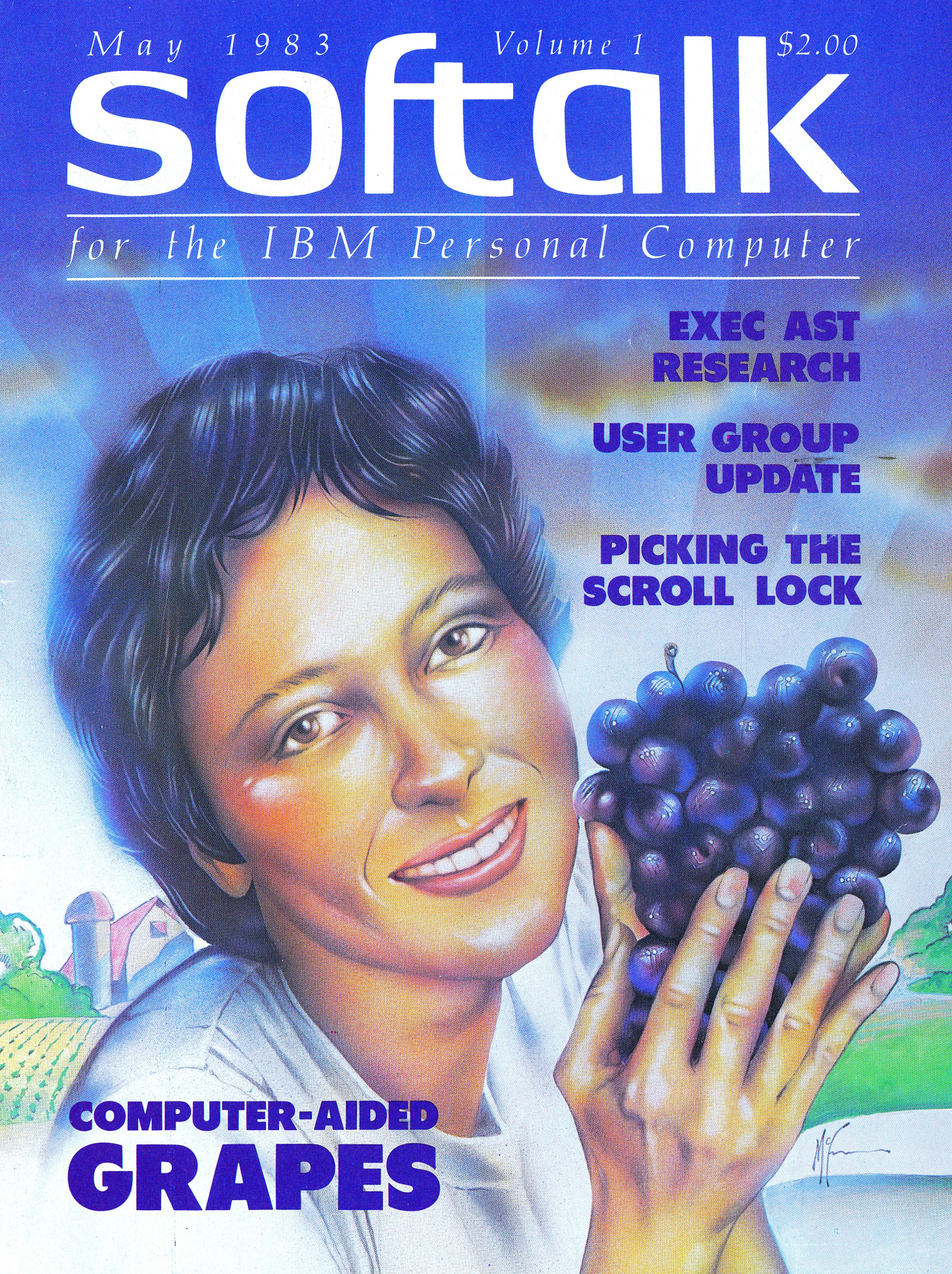
softalk

for the IBM Personal Computer



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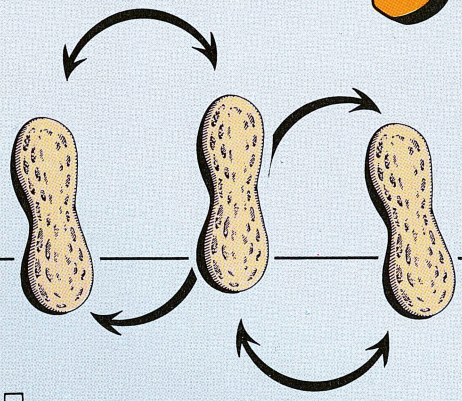

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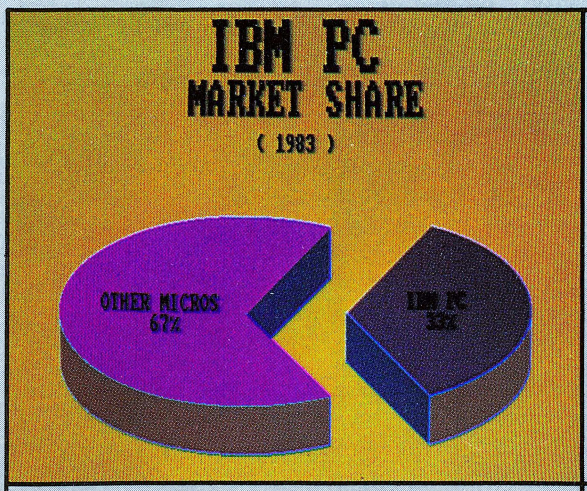

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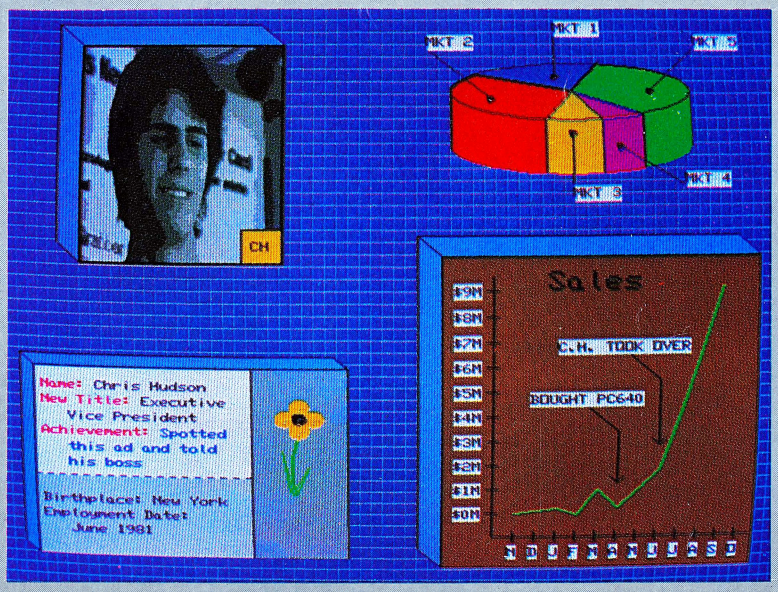

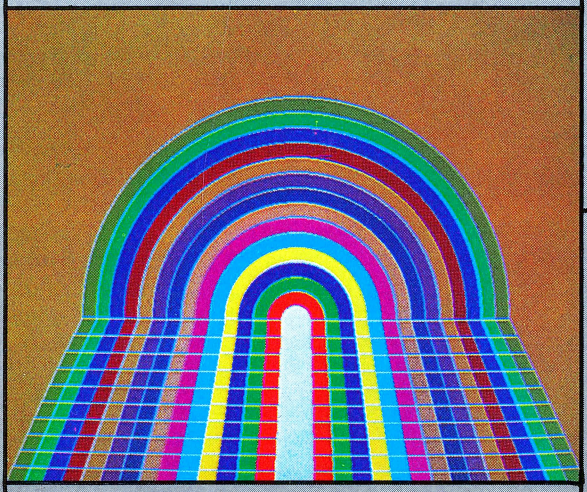

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crosstalk

On Guard

Space Guardian by Omric for the IBM pc is the worst game I have obtained for my computer. It is not even worth the disk it's stored on. I don't know why it got such a good review in the September issue.

The two big problems with the game are mentioned in the review. One is that the game has too much random damage from moving. This destroys any strategy in the game by making the game a total function of luck. I think the author has never heard of user-definable parameters.

The other major problem is that the initial setup is much too random. Once I ended up with few aliens, lots of star bases, and plenty of time; the next game was just the reverse. I have played many different versions of *Star Trek*, none of them with these problems; this version is the worst.

Except for these two major flaws, I think the game is pretty nice. If it were not for those two problems, the game would be one of the best.

David L. Brownfield, Iowa City, IA

The manufacturer responds:

The galaxy of *Space Guardian* is a dangerous place to play in. Nothing can be taken for granted. If a player insists on flying around the galaxy with the ship's shields down or at a very low level, he has to be willing to face the consequences. All the stars, for example, have their own unique gravitational fields; if you pass right next to one, pass between two of them, or perhaps try to navigate through one, the starship *Guardian* just might get damaged.

In *Space Guardian*, each game is unique. If a game setup appears too easy, try increasing the difficulty level (there are three) or ask for a new game. Just because a game looks easy doesn't mean a player is a master at efficiently completing the assigned mission. And the only way to get rated is to complete the mission successfully. *Space Guardian* was not programmed to be easy or hard; it was designed to present the player with ever-changing situations. If you want to play the same game every time, always win, fly through stars, never miss with a torpedo, and have the ship navigate for you, then do not play *Space Guardian*. If you are looking for a challenge and some fun, then *Space Guardian* is the game for you. Life, anyone?

Mark F. Stuart, Omric Corporation, Chaplin, CT

Reviewer's Disclaimer

I have written several reviews of software for *Softalk for the IBM Personal Computer* over the past few months. In general, I have agreed with editorial changes introduced into my manuscripts by the magazine. They have usually clarified points, corrected my errors, and improved the readability of my articles.

Unfortunately, the modifications of my review of *ProKey* and *Keynote* in the April issue altered my manuscript to such an extent that I no longer feel that the review represents my work. In addition to stylistic changes, alterations of my emphasis and errors of fact were introduced. Issues that I had attempted to present clearly (such as merging operations and the importance of input fields in *ProKey)* ended up incompletely explained and improperly emphasized. Because of the usual deadline pressures, I did not see the revisions of the manuscript before it went to press.

For the record, I feel that both *ProKey* and *Keynote* are programs of major significance for the pc. While my personal preference is for *ProKey*, because of its ease of use and its ability to define keyboard input fields, either program is an excellent investment. I use them constantly, and feel crippled when inappropriately designed applications software prevents their use.

I want to emphasize that this review is an exception to the usual state of affairs in my dealings with *Softalk*. I am willing to stand behind any other review in these pages that carries my initials.

Burton L. Alperson, Los Angeles, CA

Not Easy to Him

EasyWriter czar Bill Baker is right when he says, "People have higher expectations for products with the IBM label." But he's wrong imagining that version 1.1 cleared up version 1.0's problems. Here's the latest blunder.

EasyWriter 1.1's manual instructs the user to format his disk before making his one permitted copy—leading any rational person to expect that his 320K drives and a "format b:/s" will produce a 320K double-sided copy disk. What you don't learn, until it's too late, is that *EasyWriter 1.1*'s backup.bat files *reformat* your disk with a "format b:/s/1"—unnecessarily forcing it to become a single-sided 160K disk. When you try to add your spelling checker to *EasyWriter 1.1*, there's not enough room.

Perhaps Bill Baker feels this is good business, that the continual shuttling of *EasyWriter 1.1* and your spelling checker surely will greatly shorten the life of your only permitted copy of *EasyWriter 1.1*. Baker is wrong. Not only will I never buy another copy-protected program, I'll not even buy another with the word "Easy" in its title.

One expects better of IBM, but when I asked my ComputerLand to exchange my faulty disk for others with this obvious blunder corrected, the store claimed that its dealer hot line said, "No way."

Charlie Blair, Townsend, TN

The manufacturer responds:

Since the release of *EasyWriter 1.0* by IBM I've been on a personal campaign to find all of the people who have any remaining difficulties with *EasyWriter*. I am happy to report that this is the first letter in three months now with *EasyWriter 1.1* concerns.

First let me say that our company policy is that the customer is always right and is our reason for being in business. We have committed a large portion of our company's resources to customer service and training, and we do not wish any angry dollars in our bank account.

If this reader believes that I don't know and appreciate the trouble copy protection puts on the user of our product, then he is mistaken. I do. *EasyWriter 1.1* is the only product in our family of twelve products that is copy-protected. I hope that this letter represents an isolated case.

Along with this letter are two copies (one backup) of *EasyWriter 1.1* with a copy of *EasySpeller* already on the disks. Please convey my apologies to this reader. To my knowledge, no one who contacts our company has ever gotten a "No way" response. My hope is that IBM's customer service is the same.

Bill Baker, president, Information Unlimited Software, Sausalito, CA

Numbers Game

I think I have found a bug in the Basic supplied with DOS 2. The print statement

PRINT 1,2,3,4,5,6,7

prints five numbers on a line. If print zones are fourteen characters wide, and the display is eighty characters wide, you would expect six numbers on a line. That is what the Basic supplied with DOS 1.1 printed. Furthermore, the corresponding Lprint statement in all versions of Basic prints six numbers on a line.

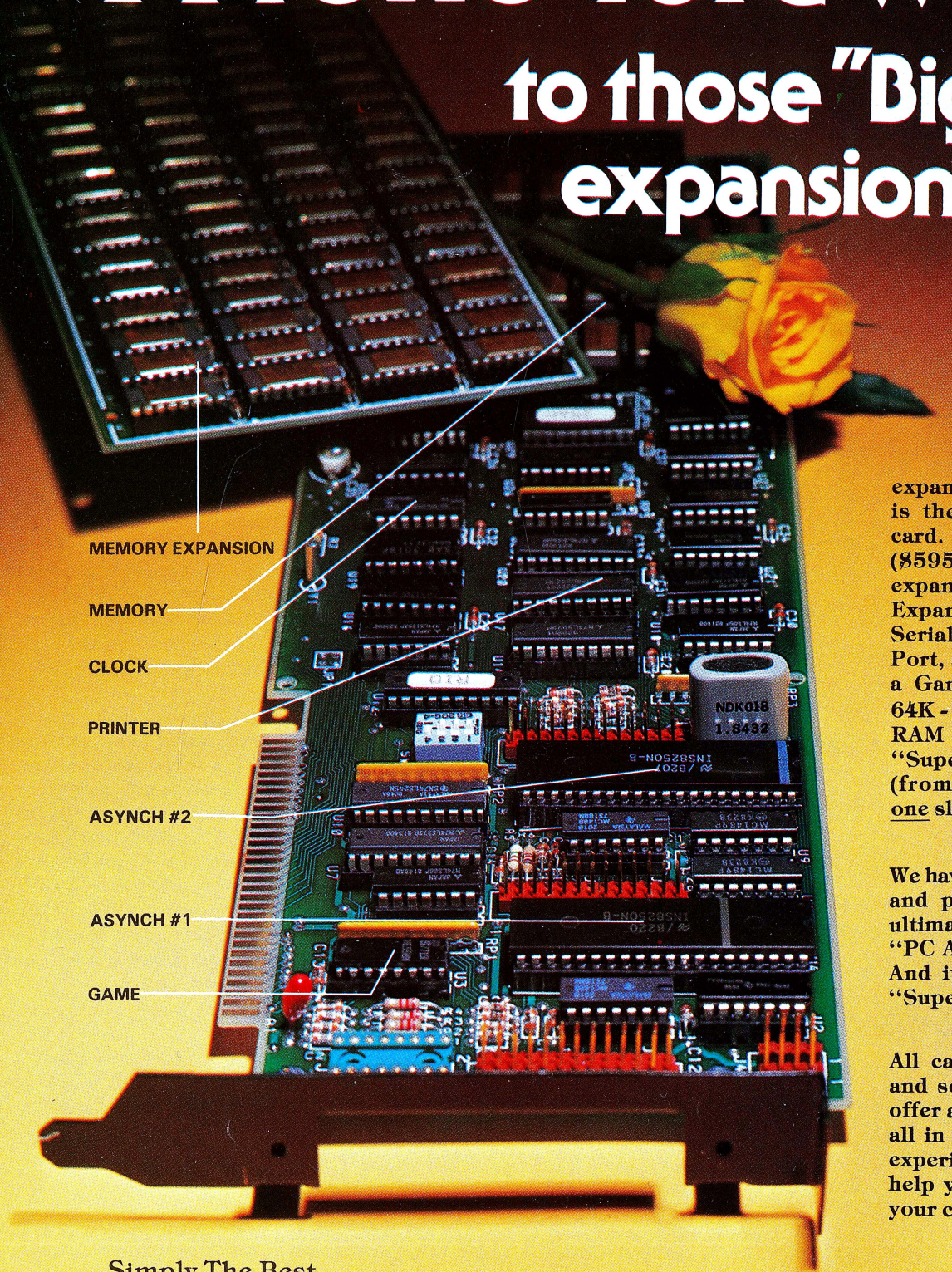
Michael Trombetta, Manhasset, NY

Unearthing the Data

My computer was purchased primarily for the purpose of doing geological research with an end view of preparing computer-generated maps and establishing and main-

A fond farewell...

to those "Big Blue" expansion blues.



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taining a geological-geophysical database for my own use in regional geological studies.

Consequently I would appreciate seeing some articles on CAD-type applications, particularly on computer-generated interactive contouring, and also more information on database management.

I have purchased *dBase II* toward that end but am not at all sure it will be ultimately adequate for my needs, though it seems to be a good place to start.

While I appreciate the importance of word processing and accounting as well as general business graphics, and use them all myself, I find that there seems to be very little microbase software readily available for the ultimate goals I have in mind. If any readers have any suggestions in this regard I would appreciate hearing them.

H. L. Albaugh, Abilene, TX

List Command

I would like to make a suggestion. At the end of each article authors should include a summary list of points covered that can be held out of the article for ready reference.

George T. Wohl, Philadelphia, PA

Drive To Subscribe

I have just received my first copy of *Softalk for the IBM Personal Computer* and find your publication excellent. Your magazine is perfect for me in that it explains technical details regarding the IBM pc thoroughly and clearly.

Other pc publications, though perhaps more commercially attractive, lack the information you provide so capably that allows people to actually use their computers, instead of just reading about random, unrelated events in the marketplace. I am informing three of my friends who have IBM pcs about your publication; I am sure they will be interested in becoming subscribers.

Larry Ellis, Wheeling, IL

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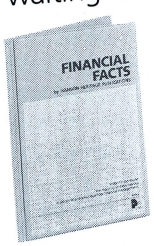

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Takin' It Easy

Several issues back a reader wrote to Crosstalk suggesting a way of underlining words in *EasyWriter 1.1* with a "dot-user" command. Either the scheme was not clearly explained, or it doesn't work on my system. I would appreciate it if someone could explain this scheme more clearly or if an alternate method could be described.

I am also looking for a way to print superscripts. Here are a few of my own tricks: for italics type control-O escape-4 to enable, and control-O escape-5 to disable. If you want subscripts, type control-O escape-S to enable, and control-O escape-H to disable. I would appreciate seeing any other "tricks" readers might come up with that are not documented in the *EasyWriter* manual.

Randolph Madera, Forest Park, IL

I am writing about a problem that I'm sure others have encountered, and perhaps solved. I'm hoping a fellow reader will respond with the solution to my challenge.

I recently purchased an IBM pc and I'm using *EasyWriter II*. It works fairly well, except that I can't use any of the special fonts that the program is supposed to be capable of. I am using the program with a C. Itoh 8510A printer. Any light that can be shed on this situation would be greatly appreciated.

John Totten, Livermore, CA

Friend of a Friend

A friend of mine lent me a copy of *Softalk for the IBM Personal Computer* and I really liked it. For a neophyte, the articles in Beginners' Corner are particularly informative.

Margot Harrison,
Hilton Head Island, SC

Marching Forward

I would like to say that I just got through reading the entire March issue, and I think it's wonderful. Please stay the way you are, instead of going the route of mass merchandising, dozens of bingo cards per issue, bad puns, and so forth.

As a comment to fellow readers, I'd like to say that disk emulator software is one of

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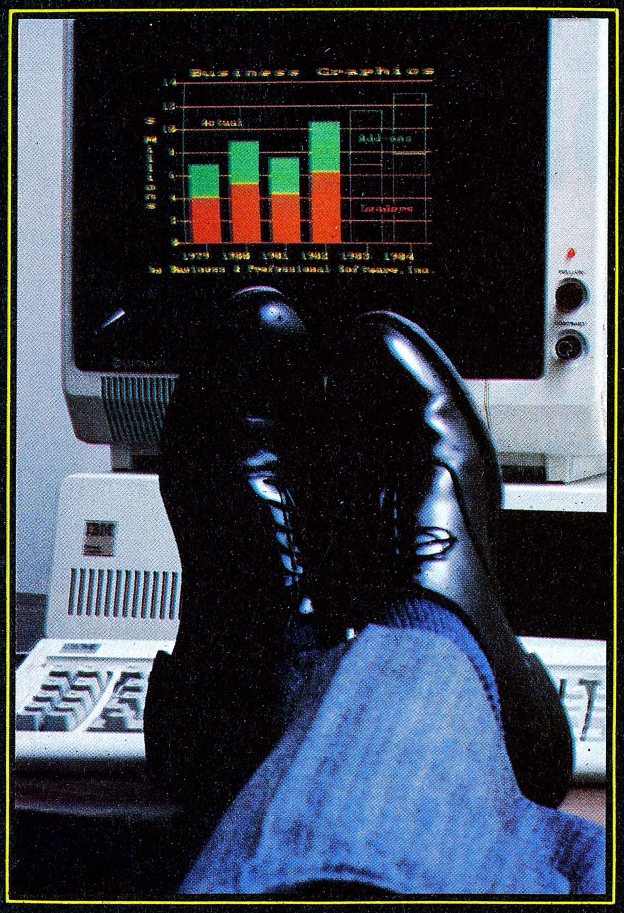

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the nicest enhancements for the pc, one that quickly sets it apart from lower-memory machines such as the Apple II. Before you buy a memory expansion card, be sure to try out the emulator program that comes with it, to make sure that it is easy to install and use. When you are looking for applications packages, you should take into consideration whether a package is copy-protected (such as *VisiCalc*) or not (such as *WordStar*). As far as I know, there is no way to use a copy-protected program in a disk emulator, because you must use *copy* or *diskcopy* commands to load the program into the pseudodisk.

This may not seem to be such a grave limitation initially, but as one becomes used to the luxury of a pseudodrive, working directly from a physical disk seems more annoying.

Kenneth Nichols, Tucker, GA

A Two-Buffer Job?

I was truly pleased to see the article, "Attack of the Printer Bug," by John Socha in the March issue. I've been plagued by this problem for several months and the fix works beautifully on my parallel printer.

I am wondering if Socha or some other enterprising individual could apply the same technique to a printer on the serial port. I have a letter-quality printer with a 2K buffer on a serial port. After the buffer fills and drops CTS, the system (DOS) drops a character every 0.68 seconds. When running at 1200 baud and typing at 10 cps, I lose 244 characters for every 2,000 characters sent. I've had my dealer and IBM Boca Raton involved, but their responses essentially were "too bad." I have gotten around the problem by inserting a 64K hardware print buffer in-line, but I'm sure other people must be experiencing similar problems. It seems wasteful using two buffers in series to get the job done.

Carl Baker, Waukesha, WI

Picture Books

I have books and articles on Apple graphics. However, I have problems translating Apple graphics into IBM graphics. Could anyone recommend a list of books and articles that would help me with my problems?

Akira Kikuchi, Detroit, MI

Spectrum of Help

As a neophyte computer user who not so long ago thought that RAM was a four-legged animal with big horns that lived in the mountains, that serial was a weekly television show, and memory was something you lost when you got older, I want to take the time to bring attention to the Spectrum Software Company of Sunnyvale, California. I purchased *Personal Finance Master (PFM)* and not only received a powerful, useful program, but individual attention and help. If any of your readers are considering the purchase of a software program to handle their finances, either at home or in a small business, I strongly suggest that they try Spectrum Software's *PFM*. It is exceptionally easy to use and has a multitude of features that are highly advantageous. The accompanying documentation is clearly and concisely written, and if necessary the company will politely and cordially help you over the phone.

Allen F. Natella, Alamogordo, NM

Tools of the Logic Trade

I enjoy *Softalk for the IBM Personal Computer*, but I find that some subjects I'm interested in are not covered by any articles currently running. I suggest you present articles on what I refer to as "universal logic." By this I mean, for example, explaining how to write your own report writer. The so-called fourth-generation languages all can take any sort fields interactively and do *if* tests, totals, and so forth. The average programmer in a third-generation language faces restrictions (are they real or imagined?) that make it impossible to get more powerful constructs. This seems true in the code I've seen, at least in Cobol, Fortran, Basic, PL/1, Mark IV, and others.

Let me explain what I mean. Is there a way, in a third-generation language, to have more than one variable containing, not data values, but other variable names? Does one have to use assembly language to construct on-the-fly multiple *if* tests in compiled languages? In general, what are the best ways to code, and how can novice programmers get better?

These are the topics I'd like to see covered. Have I missed the articles that address these matters, or are they logical trade secrets?

Howard Schneider, Babylon, NY

How 'Bout. . . .

Here are some things I would like to see in future issues. For one, I have an early model IBM with two single-sided disk drives. Let's see an article on how to upgrade, particularly since IBM has come out with the new XT. At this time, the range of accessories is downright bewildering.

Another useful article would be on database managers or electronic filing systems. I have VisiCorp's *VisiFile* which is good up to a point. What more can I get out of, say, *dBase II*? The *VisiFile* package does not include backup disks. One program disk has a bug. The program sticks at forty-seven fields. Consequently, everything comes to a halt until VisiCorp can send out a replacement. Very annoying.

G. K. Hicks, Saint Ann, Jamaica ▲

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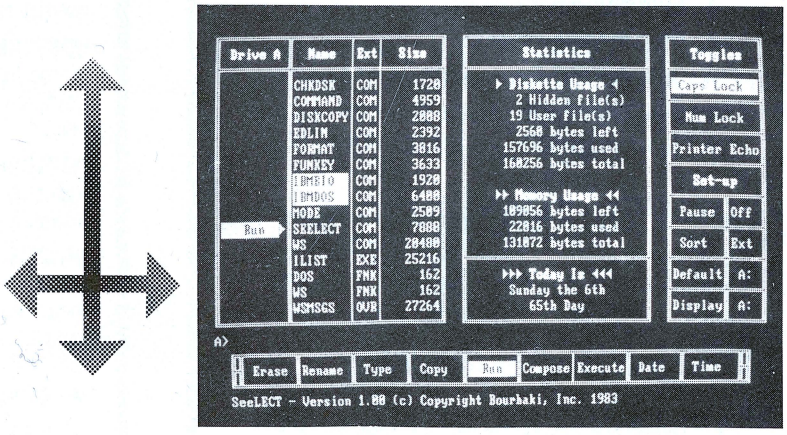

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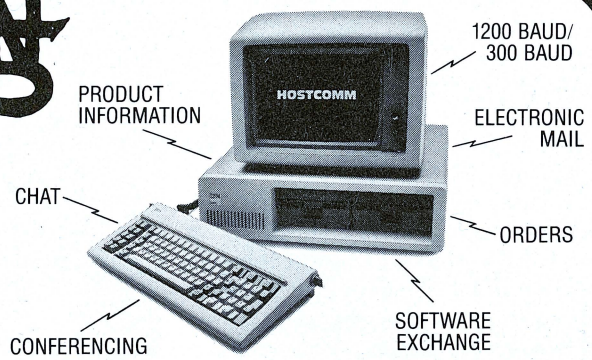

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CONTEST WINNERS

The count-the-hearts contest in the February issue did what any good contest oughta do—frustrate, baffle, confuse, and entertain. All we asked you to do was "count the ♥bugs," but, from the tone of most entries, that was too much to ask.

Do you mean the red and yellow ones, or just the black? Do clusters count as one bug? What about the illustration on page 58? Do I count the ones on page 2? Honestly, such nitpicking. Never have so many been so cranky about so little that means so much!

The magic number we were looking for was 412. The lowest number submitted was an anemic 68, and the highest number was a whopping 490. Three hundred was a favorite. Congrats to the small percentage of you who fearlessly and boldly scrawled the winning three digits and nothing else. The random-number generator sends its love, along with a check for $100, to Linda S. Wilson (Austin, TX).

For the rest of you beautiful losers, here's how it all shook down: Yes, the big red hi-res heart on page 2 counted, as did the entire number of hearts on that page. No, the airbrush illustration of the dissected heart didn't count. Yes, there is a Santa Claus. No, the earth goes around the sun.

"Don't count its appearance on this page" referred only to the word *love* spelled out, and not to the bugs on the page. Seriously, folks, when we indent and make a new paragraph, we mean it.

Several of you found nine occurrences of the word *love*, including the word spelled backwards on pages 17 and 111. That was even more than we found, but then we don't think backwards as some of you do. However, Jim DeFrisco (Fremont, CA) beat that number by one. His ten nets him $50.

The old brute-force entry scheme was attempted by Scott Ulrich (Sepulveda, CA). He submitted a separate slip of paper for each number from 200 to 400. That trick never works!

Carolee Kime (Grants Pass, OR) submitted her entry on a post card from the Royal Crest Inn. Dear Carolee: Do they place a *Softalk* in every room? Please confirm.

Well, that's all the bucks we have to hand out this month. Next issue will feature the ten limericks from the Rhyme Tyme contest, from which you get to choose the grand winner. ▲

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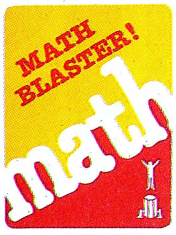

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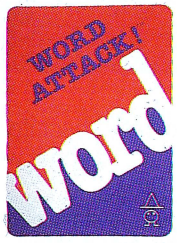

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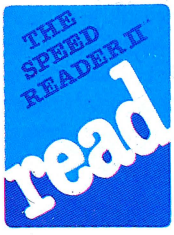

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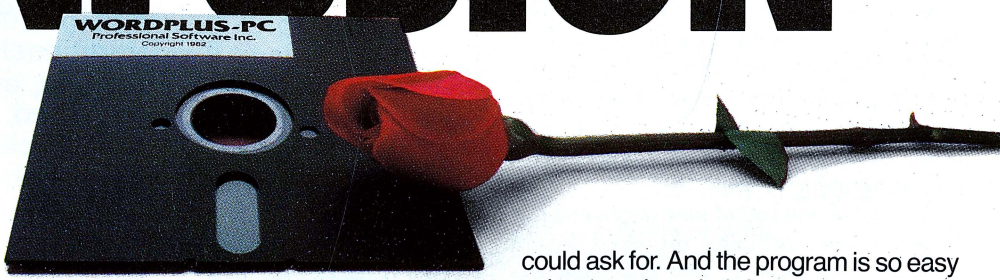

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QUESTIONS & ANSWERS

by Nancy Andrews

Q: I've entered the Basic scroll program (Questions and Answers, February 1983), but alas—I can't get it to work. I've proofread it and even changed the &h07 to &h06 to reverse the scroll direction, but nothing seems to work (or maybe I don't know what it's supposed to do when it does work). Here are my questions. What is it supposed to do? What are the ranges of the variables? Are there typos in that program? If not, what am I doing wrong?

What I'm really looking for is a way to set up a split screen of two independently scrolled windows—one to display data received on the modem and one to display data to be transmitted. I've got the tech manual, the MC6845 CRT Controller spec sheet, and the software to do everything but the split screen. Any help you can give would be greatly appreciated.

Emile F. Alline, Jr.

A: What the scroll program is supposed to do is move the text on the screen window specified by your parameters up or down the number of lines indicated in your length parameter. In the example in the February issue, the length was 6, so the text in the window should scroll down six lines.

Ranges for parameters for an eighty-column screen are

ULR: 1 to 25
ULC: 1 to 80
LRR: 1 to 25
LRC: 1 to 80

Length: not greater than the size of the window.

We're not aware of typos in the Basic version of the scroll program, but the assembly language subroutine has a few errors.

The subroutine should be named SCROLL, not SUBRT. Line 8, MOV BP, SP, should be moved to line 3, directly following PUSH BP.

Before the subroutine return, registers should be popped in this order: SI, DX, CX, BX, AX, BP.

If this still doesn't work for you, send a printout of your program to Q&A, Softalk/IBM, Box 60, North Hollywood, CA 91603, and we'll see what we can do.

There is no hardware available to set up your split screen, so the solution will have to be a software one. You can do it in Basic if speed isn't critical, and the easiest way to approach the problem would be to divide the screen horizontally. When you write a character on the screen, you will need to specify the x and y coordinates, as well as a third coordinate—the screen to which you're writing.

The scroll routine will be helpful (should you get it to work), but you will need to develop logic to generate the scroll. You will need to look at each character as you write it to the screen. If the character is a carriage return and the cursor is on the bottom line of either window, you will need to call the scroll subroutine to scroll the information in that window, so there will be room for the incoming characters. You may choose to have it scroll one line up so your new information will always be on the last line of either window.

Q: I have two questions.

Before I bought my IBM pc I had a TRS-80 and was able to peek using Basic to see which pixels were turned on. Can I do that with the pc in medium-res? If yes, where do I look?

I've written a game that fires rockets. The fastest way to fire the rockets is to press the space bar repeatedly. This is faster than holding it down and waiting for the automatic repeat. What I would prefer is to eliminate the delay before the automatic repeat and thus save my keyboard from too much abuse by anxious children. Do you know how to do this?

Dick Rafoth

A: Yes, you can peek at the screen buffer. To do this you need to start at location B8000. The even-numbered lines (starting with the top line of the screen, line 0) are in the first 8K block, and the odd lines are in the second 8K block (beginning at location BA000). There are four pixels per byte, or two bits to specify each pixel. If the two bits both contain zeros, that indicates that the pixel holds the background color—or, in other words, is turned off. The other combinations, 01, 10, and 11, each indicate one of the three foreground colors of whichever palette you're using. To peek at the

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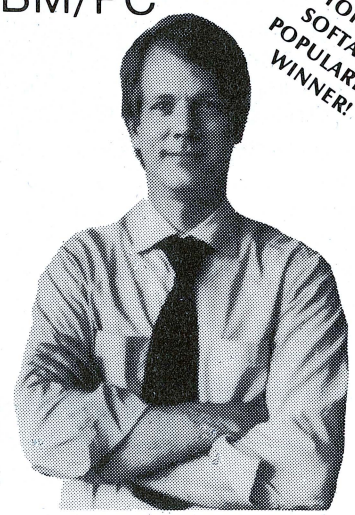

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first byte of the screen buffer, enter the following:

```
10  DEF SEG = &HB00
20  PRINT HEX$(PEEK(0)) 'Look at first location in this
    segment
```

Translate the result of this program from hex to binary, and you'll be able to tell what's going on in the first four pixels of the graphics screen. For example, suppose the program produces the hex number 54. Hex 54 is equal to 01010100 in binary. That would mean that the first three pixels have foreground color number 1 and the fourth pixel is off (set to the background color). For a more detailed orientation to the graphics screen buffer, see "The ABCs of IBM Graphics," by George Bohannon (March 1983).

A simpler way to examine selected pixels is to use Basic's *point* function. If *point(x,y)* equals 0, then the pixel at coordinates x,y is in the background color. If it equals 1, 2, or 3, then a foreground color is indicated. The *point* function returns a value of −1 if your x or y coordinate is out of bounds.

As for your second question, when a key on the pc is pressed, the keyboard sends a distinct scan code to the system unit; a different scan code is sent when the key is released. That's just what you need: As long as the "release" scan code has not been received, your program knows that the key is still pressed. Unfortunately, there is no convenient way to access those scan codes directly from Basic (or Pascal or most other higher languages either, for that matter), since routines in the ROM BIOS convert them into their ASCII representations before Basic can get to them. The way to access the scan codes directly is to do an end run around the ROM BIOS keyboard routines. That requires intercepting interrupt 10—the interrupt generated by the keyboard—and redirecting it to a routine of your own, most likely in assembler. This is exactly how John Socha's program Scrollk (see page 38 of this issue) works. (If you're interested in giving this method a try, you should also know that the IBM ROM BIOS routines are found on page A-23 of the *Technical Reference* manual, and various buffer areas are found on pages A-2 and A-3.)

Fortunately, there's an easier way out. The current status of a few special keys—left shift, right shift, alt, ctrl, ins, caps lock, num lock and scroll lock—is stored in two memory locations which *can* be accessed by Basic. (We're assuming that's what your program is written in; the concept should be workable in any language that can access absolute memory locations.)

The status of each of these keys is represented by one or two bits in these memory locations. For example, the least significant bit (LSB) of location 417 (at data segment 0) represents the state of the *right* shift-lock key. When that bit is a 1, the shift key is depressed; otherwise, the key is released.

Here's a sample Basic program that continuously reads and displays the state of the right shift key:

```
100  DEF SEG=&H0
110  MASK = &H1                ' Mask value to isolate LSB
120  A=PEEK(&H417) AND MASK
130  A$=INKEY$                 ' A dummy statement
140  PRINT A
150  GOTO 120
```

As you can see from running the program, the bit is updated with no apparent delay, so the program should be more than fast enough for real-time applications such as yours. Figure 1, at the top of page 41, details the functions represented by the byte at 417; the functions for the byte at 418, with the mask value necessary to isolate each bit shown in parentheses, are insert depressed (&H80); caps lock depressed (&H40); num lock depressed (&H20); scroll lock depressed (&H10).

Notice that some of the bits reflect the current state of the key, whereas others toggle each time the key is pressed. If you want, the mask can be altered so that various combinations can be simultaneously detected. ▲

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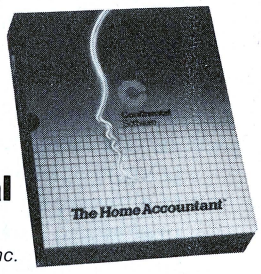

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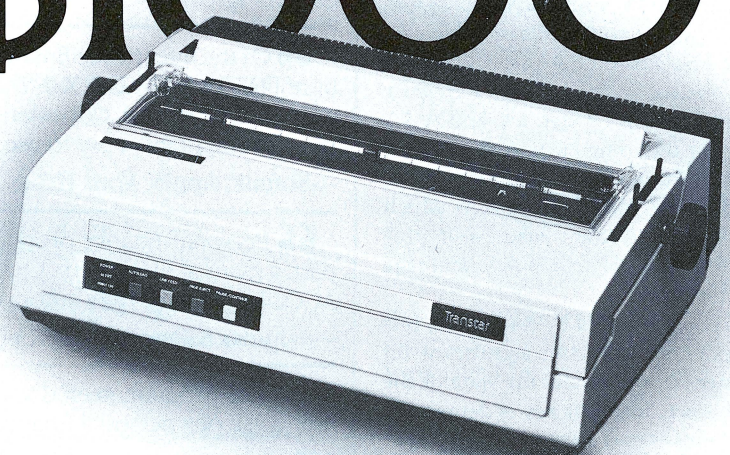
Is 42 seconds worth $1000?



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SYSTEM NOTEBOOK

by Alan Boyd

As we saw last month, DOS 2.0 has several new features. One of the most functional is the ability to construct customized hierarchical directories, which allow better use of larger disk storage devices and more efficient distribution of storage space between different users and different tasks.

This ability is not unique to DOS. Bell Labs's Unix operating system for minicomputers—and, more appropriately, the Microsoft version of that operating system for microcomputers (and DOS's big brother), Xenix—both have it. What is new is that DOS 2.0 is the first mass-market microcomputer operating system with such a capability.

A limitation of the CP/M operating system for the eight-bit micros using the Intel 8080 or the Zilog Z-80 microprocessor was its inability to work with large storage devices. To address a high-capacity Winchester-type disk drive under CP/M, users had to treat the physical device as a set of smaller "logical devices," pretending there was no large disk but rather a string of smaller devices, each with its own directory and none interacting with others.

The size of each component device had a fixed upper limit, which required users to break down large files into several smaller ones to distribute across the various logical drives—messy at best and not very workable for users accumulating large amounts of data.

Under DOS 2.0, breaking down a large disk drive into several components is an option. Users can construct numerous directories on a single drive, regardless of drive size. Logical device size, which is not fixed, is entirely up to the user.

To look at this somewhat novel situation through an example, suppose that you use your pc for word processing, database management, and as a remote terminal on an information network. Suppose also that it is connected to a Winchester-type hard disk containing all the word processing program and data files, database management files, communications files, and DOS command files lumped together in a single directory. Confusion would reign. DOS 2.0 can create several directories, organized by function or by any design you wish.

A master directory, called the *root* directory, allows access to any of the functional directories. In our example, the root directory contains four subdirectories, one for each of the functional categories of our files:

		Root	
DOS command files	**Word processing programs**	**Database management programs**	**Communications programs**

Each subdirectory is given a name, following the same rules for standard DOS file names; up to eight characters are allowed, plus a three-character extension set off by a period. Like file names, directory names should reflect the nature of the contents and should be short, since you will type the names often.

We'll name our four example subdirectories System, WP, DB, and Term. Our directory structure is relatively simple, so we won't use extensions. They would be useful for a more complex directory structure, especially if several people used the system to perform similar tasks. In such a situation, task names could define directory names, and extensions could identify the directory owners.

Once these directories are created (we'll step through the actual process in a moment), a listing of the root directory (still by use of the internal *dir* command) shows:

```
        Volume in drive B has no ID
        Directory of B:\
COMMAND   COM   17503   1-28-83   5:23p
SYSTEM    <DIR>         2-21-83   3:15p
WP        <DIR>         2-21-83   4:10p
DB        <DIR>         2-21-83   4:35p
TERM      <DIR>         2-21-83   4:50p
     5 File(s)   150528 bytes free
```

As you can see, DOS clearly marks subdirectories.

If we logged on to a subdirectory, we would then see its contents listed. Suppose *WordStar* is our word processing program and we have copied *WordStar*'s program files in the WP directory. If we logged on to that directory, the *dir* command would produce something like this:

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```
Volume in drive B has no ID
Directory of B:\wp
.            <DIR>          2-21-83    4:10p
..           <DIR>          2-21-83    4:10p
WS       COM    20864       1-01-80    12:04a
WSOVLY1  OVR    41216      11-15-82
WSOVLY2  OVR    28160      11-15-83
        5 File(s)    59904 bytes free
```

As you can see, all files associated with *WordStar* are in the same directory. The two entries that appear to be directories—represented by the single and double periods—will be explained later. For now, consider them part of the overhead required to maintain a hierarchical directory structure.

Suppose we have three classes of documents to maintain under *WordStar*—memos, letters, and program listings. When these files become too numerous to list on the screen with the *dir* command, we can create three more subdirectories, one for each class of file. Then, in addition to the *WordStar* program files, we will have three subdirectories (or, in this case sub-subdirectories), named Memos, Letters, and Programs, and our WP directory listing will look like this:

```
Volume in drive B has no ID
Directory of B:\wp
.            <DIR>          2-21-83    4:10p
..           <DIR>          2-21-83    4:10p
WS       COM    20864       1-01-80    12:04a
WSOVLY1  OVR    41216      11-15-82
WSOVLY2  OVR    28160      11-15-82
LETTERS  WS     <DIR>       2-21-83    5:51p
MEMOS    WS     <DIR>       2-21-83    5:53p
PROGRAMS WS     <DIR>       2-21-83    5:54p
        6 File(s)    58880 bytes free
```


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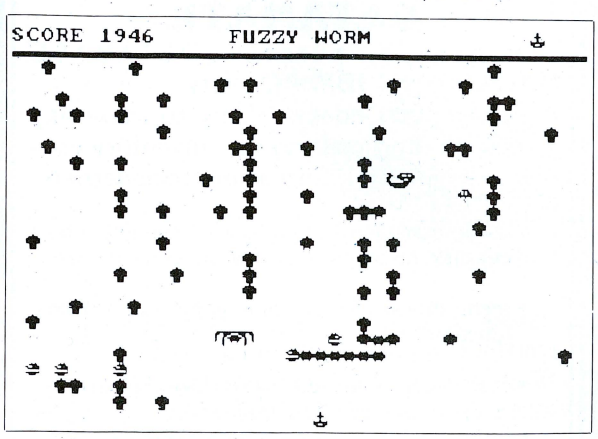

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- Requires an IBM-PC with at least 64K memory and 1 disk drive

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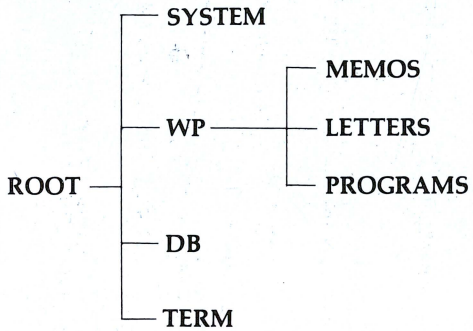
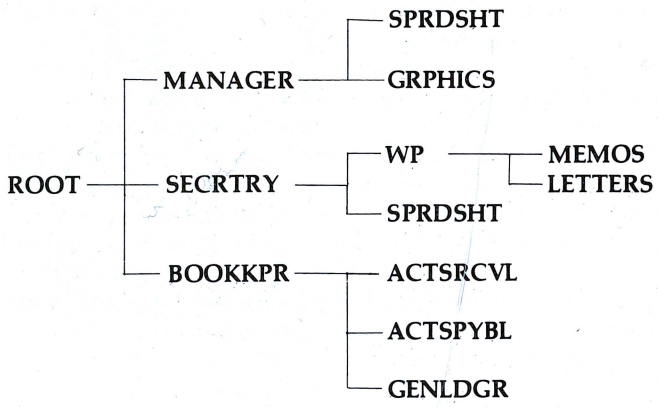
We now have this logical hierarchical file structure:



The nesting of directories could go on and on, getting more complex with each iteration. Constructing a directory hierarchy requires a balance between function and complexity, a balance dependent on the demands of the task the computer performs.

Hierarchical directories are especially useful for computers with more than one user. In an office, for instance, a manager, secretary, and bookkeeper could each have their own subdirectory in the root directory, with their own separate hierarchy of directories under it, which would help keep the file system structured and uncluttered. Such a directory hierarchy might look like this:



Notice that the manager and the secretary both have directories named Sprdsht. The manager might use her directory to create and store master models, transferring completed models to the secretary's spreadsheet directory for completion or inclusion in reports.

How does the system tell the two directories apart? The answer lies in the *pathname*—the path through the directory structure, starting at the root, that would be traversed to find the correct directory. Pathnames are strings of directory names separated by the backslash character, "\". For example, the pathnames of the two like-named directories in our example are represented by \manager\sprdsht and \secrtry\sprdsht respectively. The difference between the two pathnames is, obviously, that one begins with \manager\ and the other \secrtry\ to differentiate the two and indicate the path divergence required to reach the two directories.

Now that we've seen how directory structures look and how they can be used, let's look at the relevant new DOS commands. Foremost of these is *mkdir*, which creates new directories.

Mkdir is an internal DOS command, so you don't have to copy it to each directory in which you want to create subdirectories. And, like several other DOS commands, it has a pseudonym—*md*. Once familiar with the system, you'll find it convenient to use the short form. Until then, stick to the full name, because it is more representative.

Our first example had four subdirectories leading off the root—one each for system files, word processing files, database files, and

communications files. Before you create these directories, the new medium must be formatted with the *format* command, which creates the root directory.

That done, you create a new directory simply by typing *mkdir dirname*, where *dirname* is the name you are assigning the new directory. DOS spins the disk for a few seconds, creating the segments necessary to maintain the new directory. Issue the *dir* command again and you'll see the new directory indicated in the listing by a <DIR>. It's that simple.

As an example, let's create a new directory called Level1 under the root directory of a newly formatted disk. Before doing so, our *dir* listing might look like this:

```
Volume in drive B has no ID
Directory of B:\
File not found
```

After we type *mkdir Level1*, our listing will look something like this:

```
          Volume in drive B has no ID
          Directory of B:\
LEVEL1        <DIR>      2-21-83        7:32p
          1 File(s)  174592 bytes free
```

We are still in the root directory. To move to the next level in the hierarchy—named Level1 in our example—we use the next new command, *chdir*. This internal DOS command changes the current, or working, directory. It is the means by which we move up, down, and around the hierarchical directory system.

For our example, we issue the command *chdir Level1* to move down the hierarchy to the newly created directory. Once in the new directory, you should see something like this if you issue the *dir* command again.

```
          Volume in drive B has no ID
          Directory of B:\Level1
.             <DIR>      2-21-83        7:32p
..            <DIR>      2-21-83        7:32p
          2 File(s)  174592 bytes free
```

Notice that the *dir* command lists only the contents of the current directory. It does not list files in the root, or parent, directory. Notice also the "Directory of" message on the second line. In the root directory, this message reads "Directory of B:\". Here, in the next level of the hierarchy, it reads "Directory of B:\Level1" to show the pathname of the current, or active, directory.

Let's create another level of the hierarchy by opening another new directory, this time within the \Level1 directory—a sub-subdirectory. While in the \Level1 directory, type *mkdir Level2* and then type *dir* to list the current directory. You should see something like this:

```
          Volume in drive B has no ID
          Directory of B:\Level1
.         < DIR >      2-21-83        7:32p
..        < DIR >      2-21-83        7:32p
LEVEL2    < DIR >      2-21-83        7:42p
          3 File(s)  174080 bytes free
```

We have just created another level to the directory structure. We can now move down it by typing *chdir Level2*. Do so and list the new directory by typing *dir*. The screen should now display something like this:

```
          Volume in drive B has no ID
          Directory of B:\Level1\Level2
.             <DIR>      2-21-83        7:42p
..            <DIR>      2-21-83        7:42p
          2 File(s)  174080 bytes free
```

Go one more level by creating a new directory called Level3, then move down to that directory. Type *dir* and it will look something like this:

```
          Volume in drive B has no ID
          Directory of B:\Level1\Level2\Level3
.             <DIR>      2-21-83        7:50p
..            <DIR>      2-21-83        7:50p
          2 File(s)  173568 bytes free
```

And so on.

This little exercise shows clearly that the *dir* command under DOS 2.0 does not necessarily list all files on the disk. You will see only a listing of the files on the current directory; any files on that directory with <DIR> appended are other directories on the disk. DOS commands with some sort of file-dependent action associated with them will work only with the files in that directory.

This may seem like a step backward, since we have lost some universality of many DOS functions. This is not the case. The creation of subdirectories will make sense to users with large-capacity disk drives, such as Winchester-type hard disks. It may also perform some useful functions for those of us with floppy disks.

Before making a case for or against creating a hierarchical disk directory structure, we need to look at those functions that allow us to move rapidly from one directory to another. First, though, let's put some confusing semantics to rest. We've been introduced to the concept of a tree structure and seen that, like a real tree, it has a root. Our tree, however, has its root at the top, and we talk about subdirectories as being *below* the root—sort of an inverted tree. Consequently, when we talk about moving *down* through the hierarchy, we mean that we are moving away from the root directory and farther into the directory structure. When we move up, we move toward the root.

That said, let's look again at our example. We created a very simple hierarchy:

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Root	**(\)**
Level1	**(\Level1)**
Level2	**(\Level1\Level2)**
Level3	**(\Level1\Level2\Level3)**

We saw that we can move down through the hierarchy one step at a time with the *chdir* command, but we can go farther and faster by using this command in other ways.

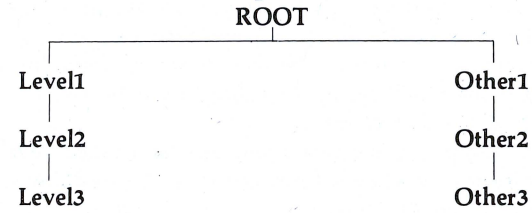
Whenever a new directory is opened, DOS 2.0 creates two files—designated by . <DIR> and .. <DIR>— and lists them in the directory. These files assist movement up and down the tree structure. The first one—the . —is DOS's shorthand for the current, or working, directory, the one on which the system is currently logged. To enter DOS commands that access the current directory, you need not enter the entire pathname; simply use the convenient shorthand method. We'll find out more about this abbreviation in months to come.

The other abbreviation—the .. —indicates the parent directory, the one immediately above the working directory. In our example, the directory \Level1\Level2 is the parent directory of the directory \Level1\Level2\Level3, and the directory \Level1 is the parent of \Level1\Level2—similar to a family-tree structure.

The .. abbreviation is particularly useful for moving up a level in the hierarchy. For example, if we were currently logged on to the directory \Level1\Level2\Level3 and entered the command *dir* .., we would see a listing of directory \Level1\Level2. If we issued the command *chdir* .., we would pop up to the parent directory, \Level1\Level2. If we entered the same command again, we would pop up to directory \Level1.

In addition to using *chdir* with these abbreviations, we can use it with a complete pathname specification. For example, if we are in directory \Level1\Level2\Level3 and want to climb up two levels to the \Level1 directory, we enter the command *chdir \Level1*. To back out completely, we can enter the command *chdir* \, the shorthand for the root directory.

To demonstrate a somewhat more elaborate use for the *chdir* command, create the following directory structure:



Now, to move to one of the extremities, type

chdir \Level1\Level2\Level3

and then move randomly around the tree by using the *chdir* command with a full pathname. Try

chdir \Other1\Other2\Other3

and verify your move to the correct directory by listing it with the *dir* command.

We haven't elaborated on the backslash, so let's do that.

If we were in directory \Level1 and entered the command

chdir Level2\Level3

with no backslash preceding Level2, we would still move to the appropriate directory. If you enter a pathname without a preceding backslash, DOS assumes you want to move relative to the current directory. Begin a pathname with a backslash and DOS assumes you're specifying an absolute pathname—one that begins at the root directory. When given a relative pathname—one without a preceding backslash—DOS essentially creates the absolute pathname by adding the specified pathname to the absolute pathname of the current working directory.

To illustrate this, go to the directory named Level1, enter the command

chdir Level2\Level3

and then type *dir* to verify that you're in directory \Level1\Level2\Level3, a relative move. Next, return to the \Level1 directory by typing

chdir \Level1

and then enter the command

chdir Other1\Other2\Other3

You should get the error message "Invalid directory," because DOS was looking for a relative offset from the current directory. In other words, it attempted to find the directory that lay along the hypothetical and, in this case, nonexistent, pathname \Level1\Other1\Other2\Other3.

This feature, useful if you are in a directory and want to move one or more levels in the hierarchy, eliminates entering the entire pathname; only the relative offset need be entered. If we are in directory \Level1 and want to move to directory \Level1\Level2\Level3, then instead of entering *chdir \Level1\Level2\Level3*, we would enter the simpler form, *chdir Level2\Level3*.

Interesting and useful, too, is the bare-bones version of the *chdir* command, which prints the full pathname of the current working directory. For example:

B: \Level1\Level2\Level3

Tree-structured directories, although very useful with large storage devices, incur penalties in storage-requirement overhead and file-access time. Whenever you create a new directory, you add to the complexity of the filing system. Conversely, the intelligent use of hierarchical file systems, which allow users to structure directory systems to their individual needs, takes advantage of many operations that work best within such a system. Next month, we'll take a look at the advantages and disadvantages of this new capability. ▲

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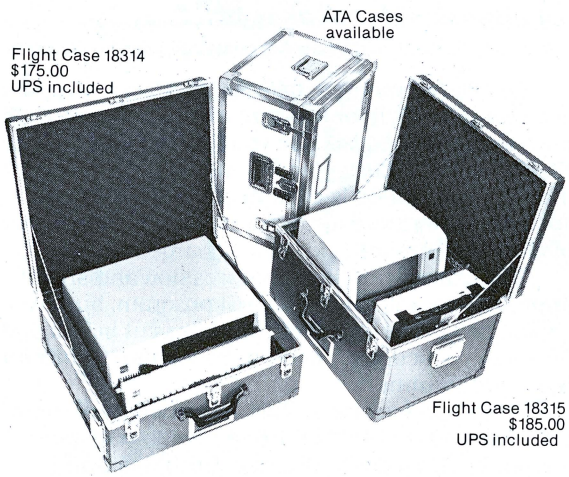

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The Calc War

Has Just Begun!

AST Research's three founders: Tom Yuen, Safi Qureshey, and Albert Wong. The three share the responsibilities of running AST, which is experiencing convulsive growth reflected in astronomical sales figures. In less than a year the firm has increased personnel from four employees to more than seventy, moved twice, and increased its production output by several hundred percent.

Exec AST: AMBITION, SKILL, AND TIMING

by David Hunter

Heard any good fairy tales lately?

Like once upon a time, two guys from Hong Kong and one from Pakistan, with no external funding, started selling expansion boards for the IBM pc, and less than two years later they're expecting annual sales to be in eight figures?

Well, if all goes according to plan, that's the story from AST Research in Irvine, California. Three ordinary guys with a lot of intelligence and guts saw an opportunity, took a chance, and are now laughing their way to the bank.

"We lucked out," says Tom Yuen, AST's vice president of marketing. He's kidding, right? We all know there's no such thing as luck in the pc market, right?

Multimillion-dollar sales figures rarely result from a series of casual events. When they do, it usually implies that somewhere along the line a chance was taken and fate intervened.

AST Research took one big chance, if you could call it that, at the outset: It put its faith in IBM. It was one of the first independent vendors on the scene when IBM announced the Personal Computer in late 1981.

Tied for First. Yuen is proud of the fact that AST was one of the first three companies to advertise hardware add-on products for the pc in *Byte* magazine's January 1982 issue. The other two companies were Tecmar and Datamac. That first ad was a fairly conservative one-third-page, black-and-white affair—typical of a young company.

Perhaps it seems like good luck to Yuen, all that has happened since that first ad, but was putting faith in IBM really taking a chance? Haven't we learned yet?

Albert Wong, Safi Qureshey, and Tom Yuen are the A, the S, and the T of AST Research. They are young, healthy, and witty—a

Dumasesque trio of high-tech adventurers. The three are equal partners and the driving force behind AST's success.

Albert Wong was born in Hong Kong and has been in the United States since 1969. Since he was nine, Wong has enjoyed tinkering with electronic equipment, particularly ham radios. He's always had a practical, methodical quality that he's carried into his professional career at companies like Datum and Technology Marketing. His knack for paying attention to details makes Wong perfect for his present position as AST's vice president in charge of production.

Tom Yuen also comes from Hong Kong, although he met Wong in the early seventies when they were both attending Orange Coast College in Southern California. Yuen is friendly and outgoing, with a lively sense of humor. He also has an impressive high-tech resume. His knowledge and personality make him well suited to the position of vice president in charge of marketing.

Safi Qureshey left his native Pakistan for America eleven years ago. He received the Bachelor of Science degree in electrical engineering from the University of Texas and worked at Computer Automation, a minicomputer firm, and later at Telefile. Qureshey is good at looking ahead, weighing options, and forming strategies. As AST's president, he's in charge of finance and product development.

Three Friends. When he graduated from the University of California at Irvine with a Bachelor of Science degree in electrical engineering, Tom Yuen went to work first for Hughes. Later, he became a senior engineer at Sperry Univac. Yuen met Qureshey while working at Computer Automation, and a friendship sprang up between the two. Yuen had remained friends with Wong since their college days.

"We all had similar ambitions," says Yuen. "We had creative talents and similar working experiences. We had all done design engineering on minicomputers."

Wong, Qureshey, and Yuen got together one day in 1980 and decided to start a consulting firm. They met in Yuen's house and formed AST Associates. One of their major contracts was with an East Coast firm for "a state-of-the-art local area network," says Yuen. It involved a fourteen-megabyte central computer and broadband communications in a connecting radius of thirty-five miles.

From this successful project and others, Wong, Qureshey, and Yuen culled forty thousand dollars of working capital and made plans to enter a different kind of market. In the summer of 1981, they brainstormed a plan to produce expansion boards for the IBM Personal Computer.

With their own money, the three contracted an outside firm to fabricate the bare circuit boards. Originally, most of the soldering and assembling of components onto the boards was done by the three, until those tasks too were subcontracted to an outside firm. Eventually, the ratio of outside to in-house assembly became fifty-fifty, which is how it remains today.

AST initially offered four products: a 64K-256K parity-checked memory board, an asynchronous communications board, a wire-wrap development kit, and a multiprotocol communications card. They first shipped product around Christmas of 1981. Sales for the first month were two thousand dollars. Yuen says, "Each month it just kept doubling."

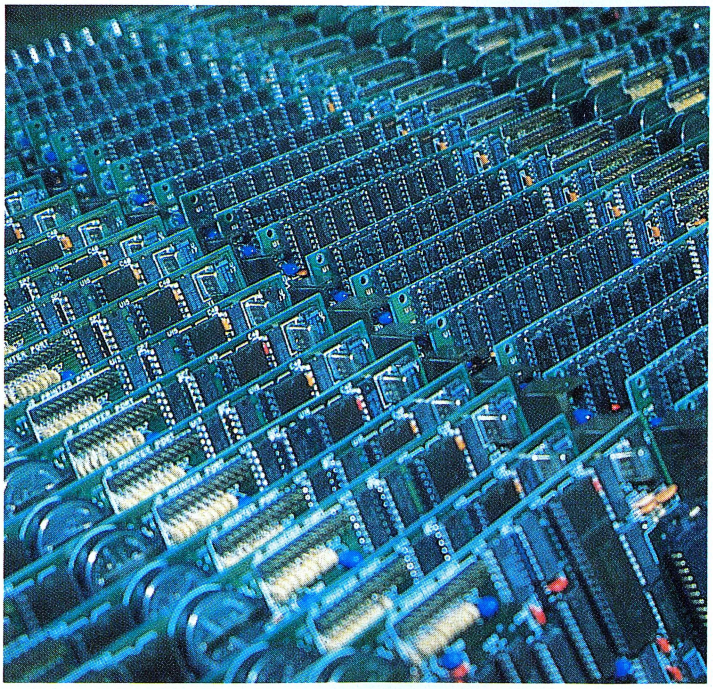
Make Room, Make Room. Until the middle of last year, AST Research (the name was changed from AST Associates late in 1981) consisted of only four people working out of a seven-hundred-sixty-square-foot suite of offices. Fueled by fantastic sales, AST expanded, moved into twenty-seven hundred square feet, hired engineers, and looked at different possibilities of where to go next.

Standard 64K multifunction boards were well on their way to reaching a comfortable market price umbrella of $595. Everybody and his brother was jumping into expanded memory products. It was time to diversify.

Wong, Qureshey, and Yuen focused on communications, believing their collective knowledge of networking and minicomputers would facilitate that logical move. With an experienced and competent group of engineers, AST has released three advanced communications products to date, with more on the way.

According to Yuen, the executive or manager who wants to use a pc to talk to a host computer is the prime target for AST's Advanced Communication Card, AST-3780, and AST-SNA. AST-3780 is a slick IBM 2780/3780 RJE station emulator, allowing the transfer of files between a host computer and the IBM pc. AST-SNA is a powerful package that lets your pc emulate an IBM 3274 Model 51C control unit and is multifunctional—expandable to include IBM 3270 single display station emulation, IBM 3270P cluster option (which allows the attachment of three additional pcs as 3278 devices), and IBM 3770 batch communications terminal emulation.

AST's current communications offerings are the first moves into what Wong calls "more sophisticated products." Requiring software support, expert documentation, and aggressive marketing, products like AST-3780 and the AST-SNA family are a big step up from extra memory and multifunction boards.



AST ships upward of eight thousand boards a week, and that figure keeps rising. All boards go through a rigorous routine of testing and retesting at AST's in-house production department.

The Magic Number. AST's present product strategy identifies three basic areas: communications, multifunction cards, and "other enhancements." The last area's products are the DiskPlus, a hard disk host adapter for Tallgrass Technologies and Corvus Systems, and Expansion Memory, a basic 64K to 256K extra memory card with two software programs, *SuperDrive* and *SuperSpool*.

SuperDrive and *SuperSpool*, an electronic disk emulator program and printer spooling program respectively, are included with all of AST's multifunction cards (MegaPlus, I/O Plus, and Combo-Plus) and are also sold separately. As with everything else they have done so far, AST is providing quality support for these products. Qureshey and Dennis Sonosky (manager of software development) are responsible for that area.

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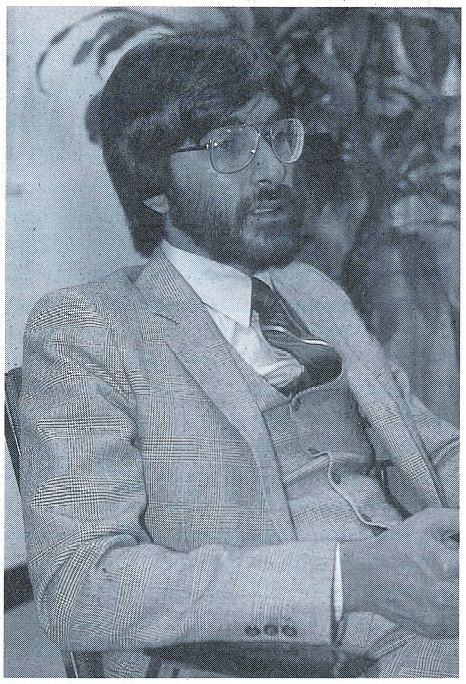
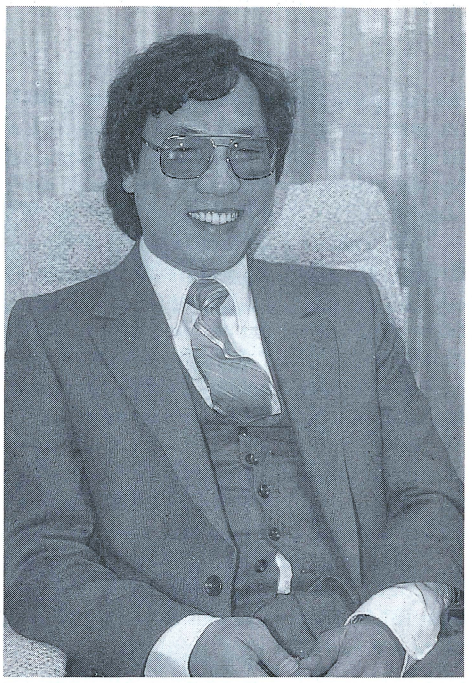

Tom Yuen, AST's vice president in charge of marketing: "We keep our eyes keen on IBM." Safi Qureshey, president, responsible for finance and product development: "We're always looking at growth opportunities, but we want to maintain a high level of expertise." Albert Wong, vice president in charge of production: "We believe in keeping the company in the United States and giving jobs back to Americans."

Four months ago, AST's astronomical growth had forced it to move from the twenty-seven-hundred-square-foot location to its current eleven-thousand-square-foot home in an Irvine industrial park. All three founders know that this arrangement is also temporary; they're now looking for an additional forty thousand square feet. If all goes according to plan, manufacturing will move in two months, with the rest of the company following in a month.

A great deal of AST's future rides on the efficiency with which it gets product to market. Almost half of its current facilities are taken up by the production area, where cards are assembled, disassembled, reassembled, tested, retested, and shipped out the door when deemed reliable.

A walk through AST's current/temporary headquarters reveals a company in convulsive growth. Two-thirds of the offices look settled, with the others waiting for whole groups of people to occupy them. The marketing and sales departments seem in good shape, as well as the technical and postsales support groups.

The manufacturing and testing area is housed in one large room. AST receives the half-assembled boards from its subcontractors and finishes assembling all the components in-house. In the case of a product like ComboPlus, all of the various optional functions, such as the IBM-compatible asynchronous port, the parallel printer port, and the battery-backed clock, are assembled on the board.

Diagnosing Burnouts. AST custom-built its own burn-in racks, which are capable of handling over eight hundred boards a day. The cards are burned in with all their functions and then put through a series of steps before they reach the shipper. First, they must survive a rigorous round of testing at full function with IBM's diagnostic program and then AST's own diagnostic program. If the card is performing properly, it is then modified—functions are physically removed, depending on the customer needs. (Unused components are saved and become option kits, already burned in and tested.) After the unwanted components are removed, the card goes through one more round of diagnostics tests before shipping.

This kind of efficiency, while achieving industry-standard quality control, is something that Wong, Qureshey, and Yuen are very proud of. Manufacturing is an advanced science, and making the jump in less than a year from seven hundred sixty square feet and ten cards a week to eleven thousand square feet, thirty-four in-house manufacturing personnel, and three hundred cards a day is hazardous. The flow of components and parts must be kept tight and reliable. AST's situation is pretty solid at the moment. Wong says that the company has an open credit line with most of its suppliers.

Another aspect of AST's operations that all three are proud of is

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the company's dealer-support services. AST has a conference room for instructing local and visiting dealers. One way the company instructs dealers is through videotape demonstrations. AST currently has six videotapes that it has sent to pc dealers around the country, often with a VCR unit. Yuen says the project has been well received.

"We believe a picture is worth a thousand words when you're trying to explain a product to a dealer," says Yuen. But words are still useful in specific situations. Every eight weeks, AST publishes a newsletter for dealers that explains how to tackle particular problems—like how to connect a certain printer.

Four for the Show. AST premiered four new products at the spring Comdex in Atlanta. According to Yuen, half were communications products and half were multifunction products. One multifunction card features a built-in FCC-approved 1200-baud modem, among other things. Another card, at its maximum, includes a clock, a parallel and a serial port, and a game controller.

In the communications area, AST is hoping to release soon an IBM 5251 terminal emulation program, which allows a pc to talk with IBM's System 34 and System 38 host computers. AST's engineers are working hard right now on various projects, with local-area networking and a turnkey hookup card, both hardware and software, among the most pressing.

Wong, Qureshey, and Yuen are all concerned about the state of the marketplace, as good businessmen should be. Yuen believes that "the present confusion" is traceable to three basic problems. First, there is confusion among dealers and users about what will and will not work with the XT. Second, there is an ever-present lack of knowledge among dealers and customers about what new products can really do. Third, major price slashing has confused both dealers and customers alike.

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AST was lucky, where other multifunction card manufacturers were not. Their cards needed only slight modification to fit into the XT's reduced slot spacing and narrower brackets. According to Yuen, they've modified some of the memory mapping but haven't had to upgrade the baseboard.

AST is now shipping upward of eight thousand boards a month, but the company is still suffering from the image of being new and therefore inexperienced. "The user wants to go with who has been in the market longest—which we have," says Yuen. "They want warranty support and quality, which we also have."

The Image Makers. With the help of an advertising department, AST should whip its image problems in short order, although it's far from invisible in the marketplace now. The company placed slick three-page spreads—that are thoroughly professional-looking and informative—in several industry magazines. Still, AST, like any company in a free economy, is at the mercy of market trends. Currently, AST is reacting to Quadram's price reduction of the Quadboard, a direct competitor with AST's ComboPlus and MegaPlus.

"We have no choice but to lower our price too," says Wong. "There are too many start-ups confusing the market right now and it hurts everybody. Quadram is feeling that and is trying to regain its market share. Tecmar is probably in a similar situation. You're going to see extremely aggressive pricing this year."

Yuen feels that "the market is ready to establish a leader. There was a strong demand for our product at the old price level. We'll lower our price to meet Quadram's and, hopefully, they're paving a way to make AST the leader."

Employee and employer relations are of paramount importance to AST's three top execs. Employees are given incentives, such as insurance and stock options. No one is expected to work late, but no one is discouraged from doing that either. Yuen says that AST has had zero employee turnover, excepting those who left for noncompany-related reasons, such as moving away from the area.

Qureshey says the hardest thing is to lay off an employee, because then it is not the employee's fault. AST is being careful to run a tight operation, not overhiring just to lay off workers later. "We were all employees of other companies ourselves, and know how that can feel," Qureshey says.

"People wonder why we don't go overseas, where labor is cheaper, to manufacture our products," says Wong. "We believe in keeping the company in the United States and giving jobs back to Americans. I think our efficiency is higher."

Chance of a Lifetime. AST is over the $1.5-million-a-month sales mark and it goes up a little more each month. Yuen says projected sales for the year should reach $30 million. And they only started shipping product seventeen months ago. What's the trick? Taking a chance.

"We keep our eyes keen on IBM," says Yuen. "We intend to grow with them in this evolving market and its mobile target." On the one hand, IBM is notoriously slow to deliver product, which is why a whole slew of hardware add-on companies have sprung up. On the other hand, IBM is aggressive in the marketplace and independent vendors have to react fast.

"If you can't adapt fast enough, you're out," Yuen explains. "The ability to make fast decisions and implement changes in a timely fashion is something that doesn't work in a large corporate environment."

The combined characteristics of AST's three founders have made the company an undisputed success. The multifunction-board market may be a bit rocky, but AST is off and running in the communications field. Wong, Qureshey, and Yuen are either geniuses or very lucky. It's more likely the former, because since when is it taking a chance to trust IBM? ▲

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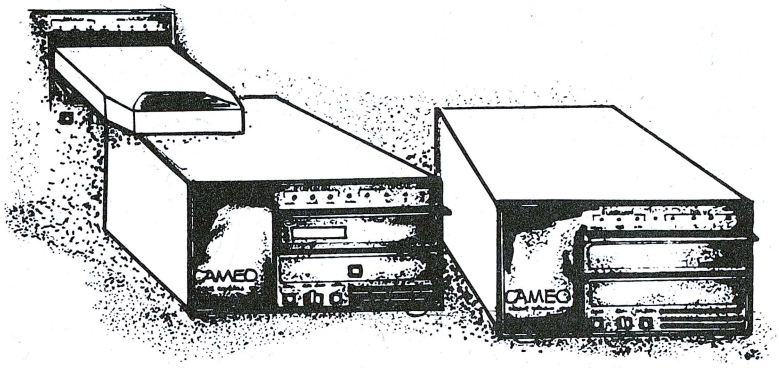

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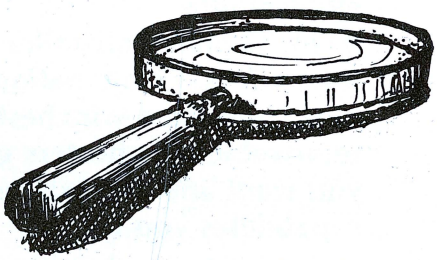

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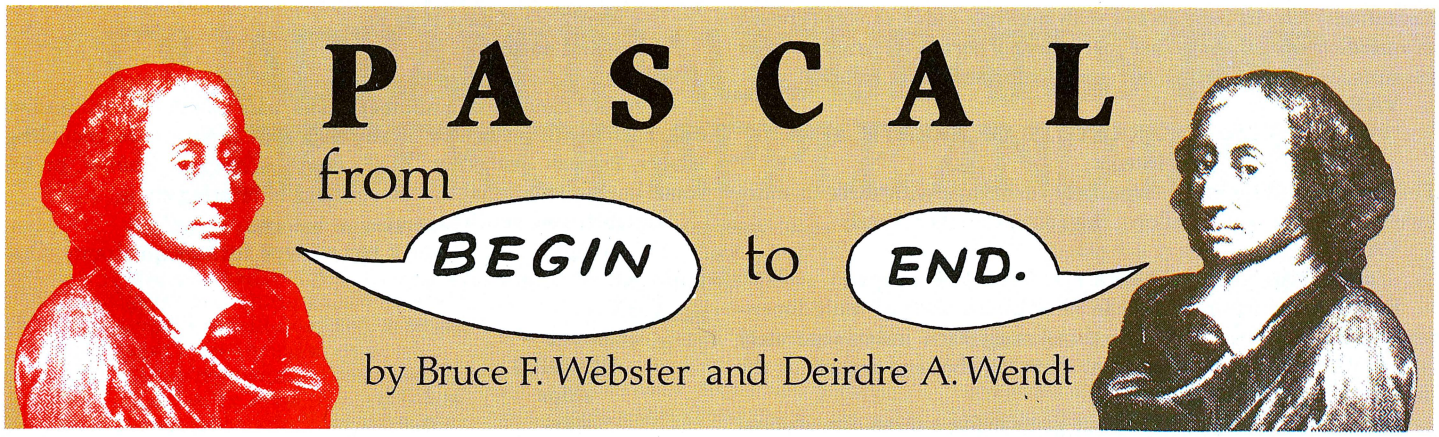

Well, we lied. Last month, we said this column would be all about files. It became obvious, though, that we really need to talk about a few other things first. So instead of files, we are going to discuss advanced data structures ("advanced" meaning anything not covered so far).

In earlier columns, you've learned about Pascal's four predefined data types—*integer*, *real*, *boolean*, and *char*—as well as user-defined enumerated data types (EDTs). (You will remember that the types *integer*, *boolean*, and *char*, and all EDTs, are collectively known as *scalar* data types.) A variable of one of these types can hold only one value at a time. For example, if we define:

```
VAR
  index          : integer;
```

then *index* has only one specific value at any moment. However, there are situations where you'd like a structure of some sort to hold multiple values, not necessarily of the same type. That's where the advanced data structures come in.

This month we'll give a simple introduction to the three standard data structures: arrays, records, and sets. We'll explain what they are and show how they're used. Next month we'll dig deeper into the fancy stuff.

Arrays. Let's suppose that we are writing a computer game that involves finding and destroying enemy starships. Our playing area is an 8-by-8 grid. Each square in the grid is called a quadrant (don't ask why). Each quadrant contains 0 or more stars, 0 or more enemy ships, and 0 or 1 starbase. Now, with what you've learned in previous columns, how would you represent the grid?

Tough, huh? Now you see why you need arrays. Simply put, an array is a collection of variables of identical type, each one of which may be referenced by a unique index value. For example:

```
VAR
  list           : ARRAY[1..10] OF integer;
```

The array *list* is a collection of ten integer variables—namely, list[1], list[2], list[3], list[4], list[5], list[6], list[7], list[8], list[9], and list[10]. You can use any of those ten variables anywhere you could use any integer variable. Furthermore, the index value doesn't have to be a literal value ('1' through '10'); it can be any expression that resolves to the integer range 1..10. For example, the statement

```
FOR index := 1 TO 10 DO
  list[index] := 0;
```

would set each of those ten variables to 0.

An array definition takes the form

ARRAY[index range] OF data type;

The *index range* can be an implicit or explicit subrange of any scalar data type (*integer*, *char*, *boolean*, EDT)—subject, of course, to implementation restrictions. For example, it is extremely unlikely that you would want to define

```
VAR
  bigarray   : ARRAY[integer] OF char;
```

since that would allocate space for some sixty-five thousand-plus characters (the implied subrange being −32,768..32767 for most microcomputers). Implicit subranges are usually used with EDTs; for example:

```
TYPE
  days          = (sun,mon,tues,wed,thur,fri,sat);
VAR
  regular       : ARRAY[mon..fri] OF integer;
  overtime      : ARRAY[days] OF integer;
  present       : ARRAY[days] OF boolean;
```

The array *regular* has an explicit index range (mon..fri), while the arrays *overtime* and *present* both have an implicit index range (sun..sat).

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The data type of an array can be any data type—*integer, boolean, char, real,* EDT, *array, record, set, pointer,* or even (in some implementations) *file*. In fact, arrays with multiple index ranges (known as *multidimensional arrays*) are just arrays of arrays (of arrays...). For example, we might define our game information as follows:

```
VAR
  stars,ships,bases   : ARRAY[1..8] OF ARRAY[1..8] OF
                        integer;
```

This can get a little tiring, especially for arrays with three or more index ranges, so Pascal allows the following shorthand:

```
VAR
  stars,ships,bases :   ARRAY[1..8,1..8] OF integer;
```

By the same manner, we can refer to elements of multidimensional arrays in two ways: by bracketing each index separately (stars[3][2]) or by bracketing all of them together and separating the indexes with commas (stars[3,2]).

Here's another solution for our game using a three-dimensional array:

```
TYPE
  quaditem          = (stars,ships,bases);
VAR
  sector : ARRAY[1..8,1..8,quaditem] OF integer;
```

Now we would refer to the number of stars in quadrant 3—2 as sector[3,2,stars]. This is a nice approach, but suffers a little from overkill. For example, we're using an integer variable with over sixty-five thousand possible values to tell whether or not there is a base in a given quadrant. One solution would be to create a separate array of type *boolean* for bases; another would be to use records. Let's look at the latter.

Records. The *record* data structure is massively useful, if handled correctly. It allows you to glue together a lot of different data types into a single structure. The basic definition of a record is:

```
RECORD
  < ident1 > : < data type >;
  < ident2 > : < data type >;
  . . . and so on . . .
END;
```

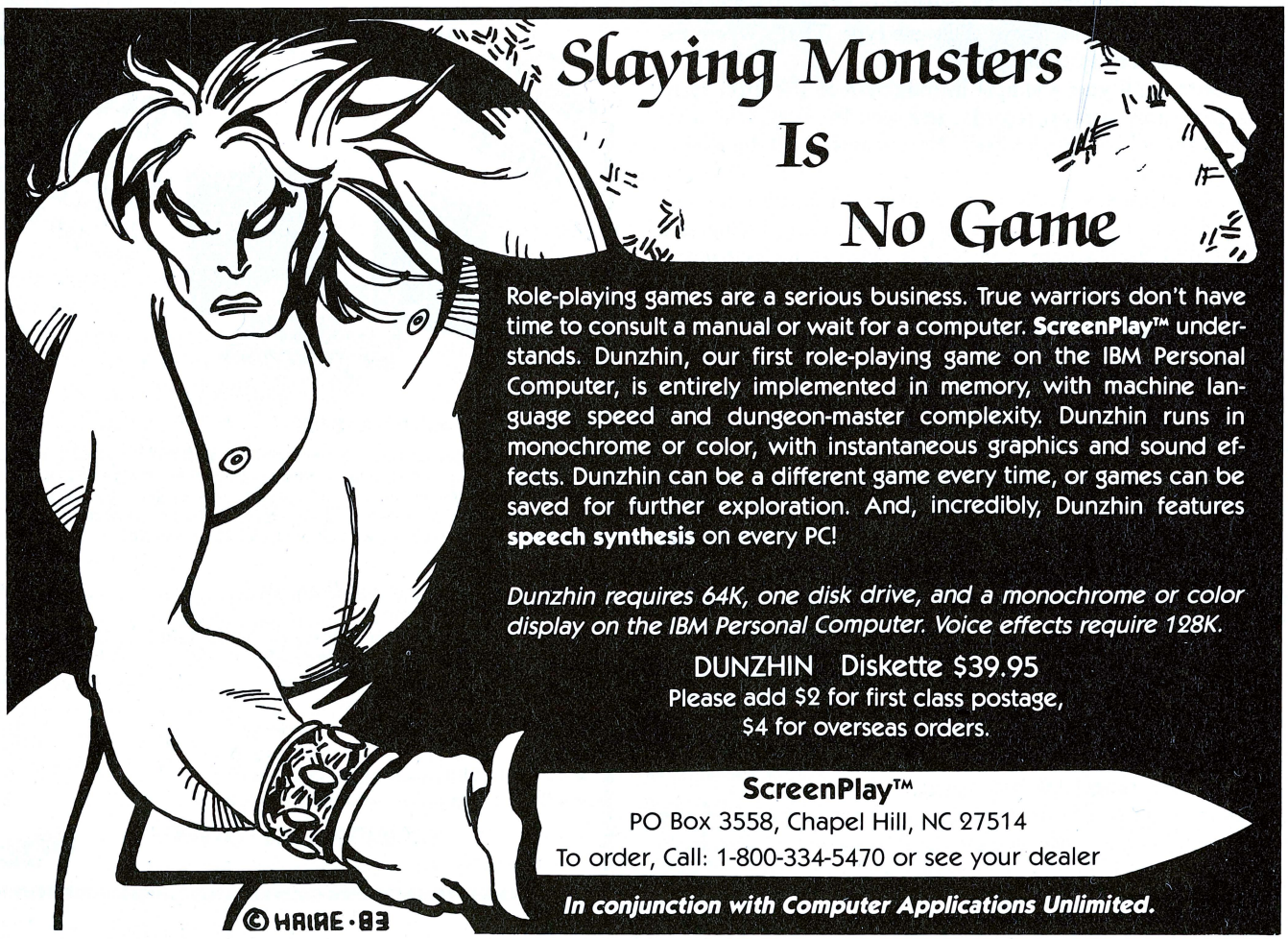
A record consists of a number of *subfields* (ident1, ident2, and so on). Each identifier can be of any data type or structure, including *integer, boolean, real, char,* EDT, *array, record, set, pointer,* or (in some implementations) *file*. A subfield is referred to as

variablename.subfieldname

For example, let's define a record type for our quadrants. One approach we might take is:

```
TYPE
  quadrant =
    RECORD
      ships        : 0..15;
      stars        : 0..9;
      base         : boolean
    END;
VAR
  sector           : ARRAY[1..8,1..8] OF quadrant;
```

Note well that *ships, stars,* and *base* are *not* elements of an enumerated data type as they were in the last array example; they are subfield identifiers for the record type *quadrant*. Accordingly, we would refer to the number of stars in quadrant 3—2 as sector[3,2].stars. Note also that in setting up this record, we've restricted the possible values of the subfields *stars* and *ships* to a very small subrange of integers, and we've changed *base* into a boolean variable. We thus avoid two problems: (1) having our variables take on legal but nonsensical values (such as −34 stars), and (2) using less memory. For example, under UCSD Pascal, our first array named *sector* (3—D, of type integer) would take up 384 bytes, while



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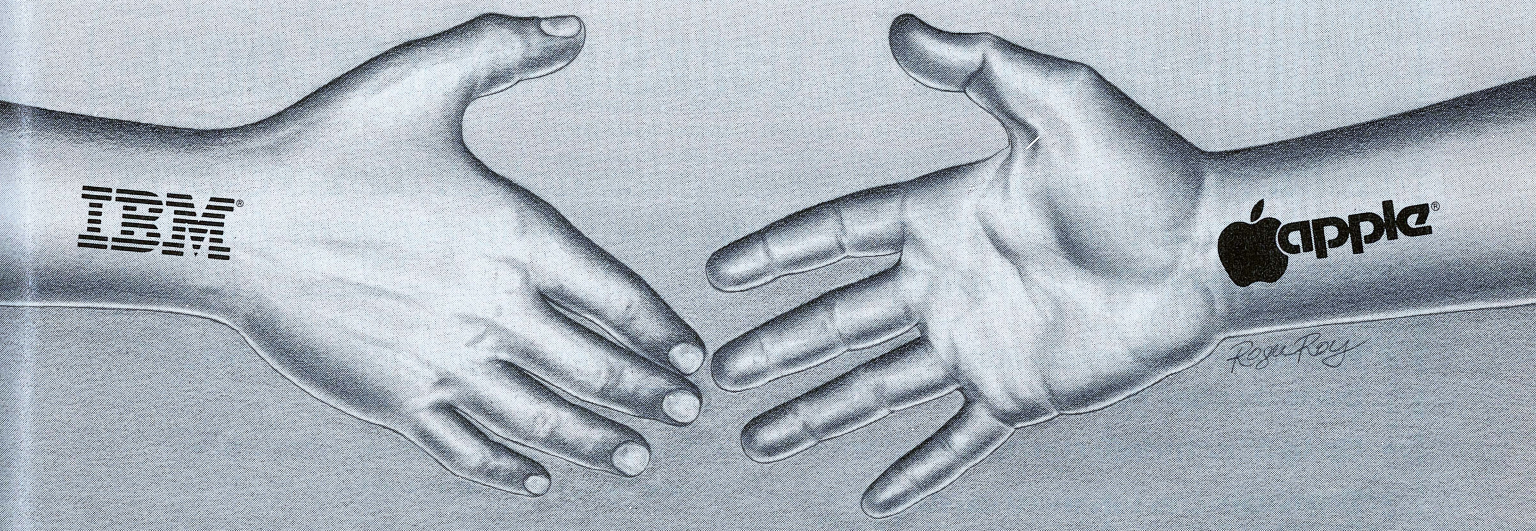

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the one we just looked at would take up only 128 bytes.

Sets. There are times when we want to test a scalar variable (*integer*, *char*, *boolean*, EDT) to see if its current value belongs to a set or collection of values. For example, suppose we want to write a subroutine that will write out a prompt for the user and then accept and return only a character belonging to an allowable set of characters. Using what you know now, how would you do that?

If you're really clever, you might come up with something like this:

```
TYPE
  charset          : ARRAY[char] OF boolean;
VAR
  okset            : charset;
```

You could then set each location in *okset* to the appropriate value (*true* or *false*) and use that to check the characters read in. Unfortunately, this approach tends to eat up lots of memory. Fortunately, it's not necessary. Pascal handles sets for you.

A *set* can be defined for any scalar data type, although, as before, care must be taken in how the set is defined (a *set of integer*, for example, would be 8,192 bytes in size). Let's use our preceding example and write a subroutine that we will call getchar:

```
PROGRAM chartest;
TYPE
  charset          = SET OF char;
  (* we will assume the data type string *)
VAR
  cmd              : char;
PROCEDURE getchar(VAR ch : char; msg : string; okset :
                    charset);
  (* purpose        write msg; read ch; return only when ch is
                    in okset *)
BEGIN
  REPEAT
    write(msg); readln(ch)
  UNTIL ch IN okset
END; (* of PROC getchar *)
(*  main body of chartest *)
BEGIN
  REPEAT
    getchar(cmd,'CHARTEST > S)peak, C)ount, Q)uit: ',
            ['S','C','Q']);
    CASE cmd OF
      'S'   : writeln('Woof! Woof!');
      'C'   : writeln('1, 2, 3, 4, 5, 6, 7, 8, 9, 10')
    END
  UNTIL cmd = 'Q'
END. (* of PROG chartest *)
```

The boolean expression *ch in okset* returns *true* if and only if the value of *ch* is in the set *okset*. For our example, *ch* must be 'S', 'C', or 'Q' in order for this expression to be *true*. Note that this expression will be *false* when *ch* is 's', 'c', or 'q', since lower-case letters are not the same as upper-case letters.

Closing Comments. Having given a basic introduction to arrays, records, and sets, we'll call it quits for this month. Play around with what we've discussed and see what you can come up with. Next month, we'll get into some more advanced features of these data types and give a complete program using them.

One last comment: If you have any questions about what we've covered, requests for new topics to cover, or any other feedback (within the limits of good taste), please feel free to write to us c/o *Softalk for the IBM*. We'd especially like to know what you've liked and what you haven't. Thanks. ▲

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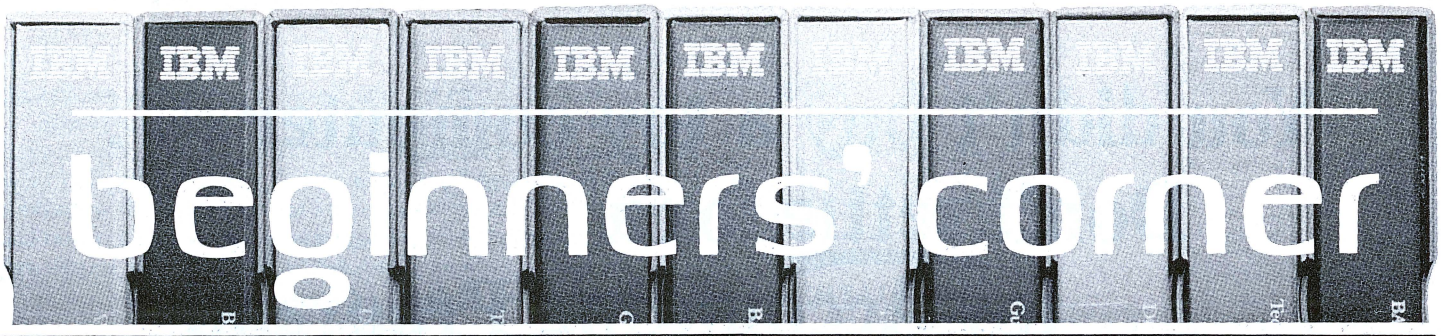

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The purpose of ASCII is to convert all the various alphanumeric symbols to numbers, so that the computer can store, evaluate, compare, sort, transmit, and otherwise manipulate them. Each letter of the alphabet (both capital and lower case), each punctuation symbol, and each of the common arithmetic symbols gets its own unique ASCII number. A few other mysterious characters get ASCII values as well.

How many numbers do we need in order to provide each character with its own identity? Well, the alphabet consumes fifty-two, and the numbers another ten. We need ten more for the symbols you get when you hold down a shift key and type number keys. That makes seventy-two so far. If you check out the white keys in the center of your keyboard (excluding the number keypad for the time being), you should find another twenty-three characters in need of codes (don't omit the space bar; spaces have to be coded just as visible characters do).

Now we're up to ninety-five, and before we go any farther in this discussion we need to digress, to take another quick look at the way numbering systems work.

In decimal counting, if you have a single digit, that digit may represent any of ten values—0 through 9. Adding a second digit increases the range of possibilities by a factor of 10; that is, with two digits you can write any of a hundred numbers, 0 through 99. A third digit increases the scope by another factor of 10, and so on. To generalize, in the base ten, or decimal, numbering system, the number of unique values possible with a given number of digits is equal to 10 raised to the power of the number of digit positions available. And the highest number that can be expressed with a given number of digits is equal to 10 to the power of the number of digits—minus 1.

Substitute 2 for 10 and you can make the same assertions about the binary system. The number of unique values available is equal to 2 to the power of the number of binary digits (bits) in use. And the highest number that can be expressed is equal to the power of the number of bits—minus 1.

Now the first eight powers of 2 (starting at 2 to the first power) are 2, 4, 8, 16, 32, 64, 128, and 256. A moment ago we found that our alphanumeric character set amounted to some ninety-five unique characters—squarely between 2 to the sixth power and 2 to the seventh.

So to encode that character set we need seven bits, but we won't use quite all the possibilities those seven bits afford. Computers, as you know, generally shuffle information around in bundles of eight bits (the eight-bit unit generally being called a *byte*). Memory locations on microcomputers all hold eight bits, and the pathways over which data is transferred, on most microcomputers (including your pc), are eight bits wide. So a seven-bit ASCII code on a machine oriented to eight-bit quantities makes for a certain superfluity of resources. What should we do with the eighth bit?

On most microcomputers and with most programs, the eighth bit is used as a signal of some sort. For example, when you press a key on an Apple II, the Apple sends the ASCII value of the key pressed to a certain memory location. At the same time it *sets* the eighth bit (makes it a 1) to tell whatever program is running that someone has pressed a key. As soon as the program acts upon the key pressed, it *clears* the eighth bit (makes it a 0), so that an instant later, when it comes time to examine that memory location again, it will know whether the value held there represents the same key newly pressed or simply information already processed.

Extended ASCII Code. The IBM Personal Computer takes a different approach. It uses an extended ASCII code with 256 distinct values; in other words, it uses an eight-bit extended ASCII code.

The character set on your pc includes—in addition to the standard English-language characters, numbers, and punctuation symbols—a variety of accented characters, certain Greek letters, some math symbols other than the simple arithmetic operation signs, and a number of block graphic "characters." All of these extra symbols are represented by ASCII values between 128 and 255—in other words, by ASCII numbers with the so-called *high bit* set.

This extended character set on the pc accomplishes a couple of important things. First, it greatly simplifies the work of programmers developing applications for markets outside the United States. It means, for example, that a programmer can write a word processor specifically for a language like French or German without having to resort to such clumsy measures as backing up apostrophes or quote marks over vowels in order to get accents or umlauts. It also makes it easier to create text processors specialized for scientific or mathematical documents. The customary way of dealing with non-English characters on microcomputers is to draw them in hi-res graphics, but that approach takes a lot more programming and eats up a lot more memory. If you want to write a word processor for Japanese or Arabic on the pc, you'll still have to do it in graphics, but the European languages at least (except for Russian and Greek) are covered.

The other big advantage of the pc's extended character set is the capability it affords for doing primitive graphics.

One of the frustrations about the design of this machine is its provision for two separate display adapters—one monochrome, the other for color and graphics. One is tempted to believe that IBM initially planned to produce a computer without graphics functionality and only added the graphics somewhere in mid-design—perhaps at the urging of outsiders who had been in the microcomputer field awhile.

In any case, it's clear that IBM wanted to provide at least a crude picture capability for those who would be using their machines primarily for text and who would hence decline the opportunity to buy a graphics adapter. The text graphics characters, which occupy the ASCII region from 176 to 233, consist of various kinds of blocks, border elements, corner pieces, and so on. Primitive, to be sure, but they do make for pretty menus and allow programmers to write rudimentary games for the monochrome adapter.

Your keyboard doesn't have keys for accented letters or graphics elements, so how do you make these extended-ASCII characters appear on your screen? There are several ways.

First, programs can do whatever they want with keyboard input. The usual course of events is that when you hit a key the ROM-resident keyboard-handling routines put the ASCII number equivalent to the key you've hit into a certain register in the microprocessor (the AL register), and whatever program you're running retranslates that ASCII number back into the character you've typed for purposes of display on-screen. In order to get the character on-screen, the program you're running has to

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Then type *run* or hit F2. You'll notice some strange things happening at the beginning of the program run; these will be explained presently. You'll also find that the program output quickly scrolls off the screen. To slow the program down, add the following two lines (you don't need to retype the others):

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33 FOR PAUSE = 1 TO 500
36 NEXT PAUSE
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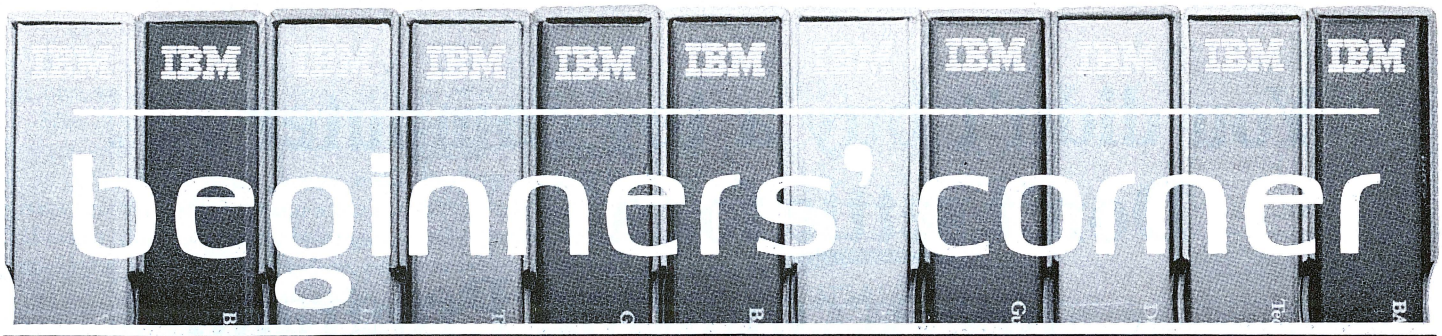

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But that's a little clumsy if all you want to do is see what characters correspond to what numbers. There are much simpler ways. In Basic or in DOS, you can see the character equivalent to any ASCII number by holding down the alt key, typing the number in question on the number keypad, and then releasing the alt key. You have to use the number keypad; the number keys at the top of the keyboard won't do it. If you type a number greater than 256, the computer will divide your number by 256 and then act as though the number you typed was the remainder after that division. In other words, if you hold alt and type 612, the computer will divide 612 by 256, coming up with 2 and a remainder of 100; then it will throw away the 2 and give you the same character you would get by typing alt-100 (this arithmetic operation, incidentally, is called taking your number *mod* 256).

Another way to put the high-ASCII characters on-screen is to get into Basic (any Basic—cassette, advanced, or disk) and type *print chr$* followed, in parentheses, by the number of the character you desire. Typing *print chr$(146)* (and hitting enter), for example, will get you a cap AE ligature.

If you want to see the whole character set, try entering the following little program:

```
10 CLS
20 FOR N = 0 TO 255
30 PRINT N, CHR$(N)
40 NEXT N
```

Then type *run* or hit F2. You'll notice some strange things happening at the beginning of the program run; these will be explained presently. You'll also find that the program output quickly scrolls off the screen. To slow the program down, add the following two lines (you don't need to retype the others):

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seven-bit ASCII set. So *WordStar* does something creative with the high bit; it uses it to signal the last character of a word followed by an expandable space—that is, a space that *WordStar* regards as expandable for the purpose of right-margin justification.

The IBM pc translation of *WordStar* is not essentially different from the original CP/M-80 version, and it does the same number with the high bit. So if you create a document in *WordStar* (in the program's document mode) and then take a look at the file from DOS (by entering the DOS command type followed by the name of your *WordStar* file), you'll see a lot of strange characters lurking in your file. *WordStar* will have taken the last character in most of your words and bumped its normal ASCII value by 128 (by setting the high bit). Those characters will look prefectly normal from within *WordStar* but will look like Greek (some of them literally) in almost any other context.

Conversely, if while in *WordStar* you use the alt key to enter some characters with ASCII numbers above 128, what you'll get on-screen will not be the same as what you get by this procedure when you're in Basic or DOS. *WordStar* will display the character whose ASCII number is 128 less than what you think you've asked for. This is, of course, frustrating if you really want that cap AE ligature for your Latin essay.

On the other hand, even if *WordStar* could give you the full IBM pc character set, your printer might not know what to do with it. Most printers are programmed (like your computer, they have a character set stored in a ROM chip) to respond only to the standard ASCII values. Most dot-matrix printers, the Epson/IBM models included, have graphics routines that will copy anything on your screen—pictures and/or nonstandard text included. But it takes special software instructions to activate these routines; the normal print procedures employed by most word processing programs speak to the text character set of your printer, not to its graphics facilities.

If you want to see what your printer makes of IBM's character set, modify that little Basic program of a few paragraphs back, substituting *lprint* for *print*. If you put the two *pause* lines in the original program, take them out by typing 33 and hitting enter and then typing 36 and hitting enter. Now run the program and see what happens. Don't worry; you can't harm the hardware. You will, however, find that your printer behaves even more strangely through the first thirty-two ASCII values than your screen did.

If your printer runs off about twenty lines and then seems to quit, you'll probably need to do the following: reboot your machine by typing control-alt-delete; then retype the program thus:

```
10 FOR N = 32 TO 127
20 LPRINT N,CHR$(N)
30 NEXT N
40 FOR M = 160 TO 255
50 LPRINT M,CHR$(M)
60 NEXT M
```

Running this version of the program will get you around those pesky first thirty-two characters (and their brethren with the high bit set) and let you look at your printer's rendition of the IBM ASCII.

Those first thirty-two characters are called control characters. The best way to understand their function is to remember that computers constantly have to process instructions as well as data, and they have to be able to distinguish between the two. This is true of peripheral equipment—such as your CRT screen, printer, or modem—no less than of the microprocessor.

When your computer is engaged in displaying information on your screen, essentially what it's doing is transmitting a stream of ASCII values to the CRT (actually to the display adapter, which communicates with your monitor). How should it tell the screen to start a new line, move to its home position, or clear itself?

The simplest solution is to mix the orders right in with the text, by setting aside a range of ASCII values to act as commands. The commands, called control characters, are usually achieved at the keyboard by holding down the control key and then striking some other key.

There are a couple of exceptions; the escape key, which sends an ASCII value of 27, is generally considered a control character, although you don't have to do anything with the control key to get it. And some of the control characters are used so often that keyboard designers provide single-key equivalents: In nearly all contexts, for example, hitting the enter key does the same thing as typing control−M. Try it.

The reason your printer behaved strangely when you read it the full ASCII series in sequence is that you've sent it all sorts of commands—in an uncustomary context, at that. Depending on the design of your printer, you probably made it beep when it got to ASCII 7, skip a line at ASCII 10 and 13, go into condensed mode somewhere in the series (if it has a condensed mode), and perhaps give up in despair at handling so many arbitrary and possibly contradictory requests.

Some of the control characters, like control-C and control-M, have fairly standard meanings in a lot of different contexts; others do not. We'll have more to say on this subject next time. ▲

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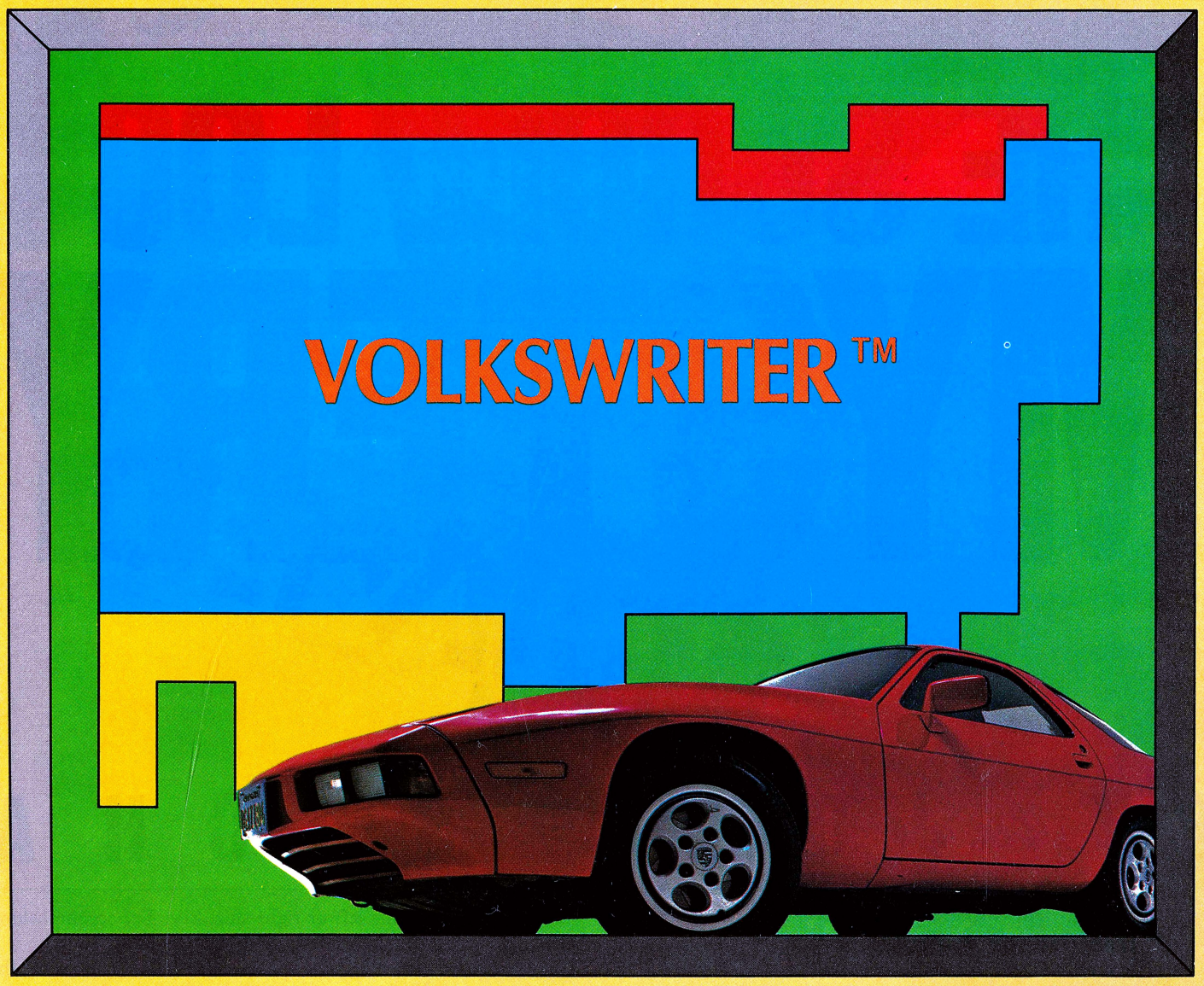

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THE SCROLL LOCK MYSTERY "SOLVED"

BY JOHN SOCHA

In the upper-right corner of your keyboard you'll find a key marked "Scroll Lock." What does it do? Not much, as one *Softalk* reader, Howard Schneider, noticed: "The manuals say the scroll-lock key is just there to detect whether it [the key] has been depressed, and that it's up to the programmer to supply the function. How do I do it?"

Sounds silly, doesn't it? Why would IBM include a key whose only purpose is to detect whether it's been pressed? Reason tells us that that key should add a scroll-lock function to DOS. And it can. This article presents the program Scrollk.com, which does exactly that.

Scrollk.com is a machine-language program, which we'll generate with the help of a Basic program. You'll need only a cursory knowledge of Basic and DOS to build Scrollk.com. But first, let's do a bit of field work to see what the pc does whenever you depress the scroll-lock key.

The Clue. Enter Basic and type in this simple program:

```
10  A = 0
20  PRINT A
30  A = A+1
40  GOTO 20
```

Run this program and you'll see numbers flying past. So press the scroll-lock key to stop this torrent. What? Nothing happened? As Schneider discovered, your pc remembers whether scroll-lock is on or off, but it doesn't use this information.

We'll change that with Scrollk, which uses the scroll-lock information to freeze the display. Now control-numlock does the same thing, so why should we want Scrollk? We'll soon see that Scrollk can display another twenty-three lines or just one more line whenever you press the left or right shift key. Try accomplishing that with control-numlock.

Before we build Scrollk.com, let's do a bit of digging to find the byte where your IBM stores the scroll-lock information.

Excavating the Site. For this dig we'll be using the DOS program Debug.com, which you'll find on your DOS disk. Find it, then type

```
A>DEBUG
-
```

to enter the debugger (enter underlined text verbatim; the other text shown is your pc's response). The hyphen is Debug's prompt character, similar to DOS's greater-than sign. To examine the memory location where IBM stores the scroll-lock information, type

```
-D 40:17 17
0040:0017  00
```

That's a single space between the 40:17 and the 17; and the D may be typed either in upper or lower case. The 40:17 represents a memory address (417 in hexadecimal notation, which is equivalent to 1047 in decimal). Debug says that location 417 hex holds the value 00 (the 00 is also in hex notation). You may see a number different from 00, but that number should change when you press the scroll-lock key and type the same command again:

```
-D 40:17 17
0040:0017  10
```

You might see numbers other than 00 and 10. Why? Because this one memory location stores a tidbit of information about the keyboard status in each of its eight bits (see figure 1 for details). We're interested only in bit 4, which holds the state of the scroll lock. This bit changes from 1 to 0 or 0 to 1 whenever you press the

Illustration by Kevin McKeon

Num Lock
Scroll Lock
PG UP

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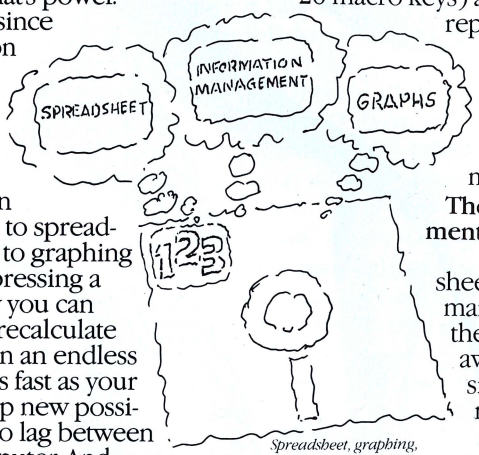

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Byte at Address 417 Hexadecimal

7	6	5	4	3	2	1	0
<---	---	---	---	---	---	---	--->

BIT NUMBER	ON WHEN:
7	the insert state is active
6	caps lock is on
5	num lock is on
4	scroll lock on
3	the Alt key is pushed down
2	the control key is down
1	the left shift key is down
0	the right shift key is down

Figure 1.

scroll-lock key. Scrollk checks this bit to see if the scroll lock is on. If bit 4 is set (equal to 1), Scrollk freezes the display; if it is clear (equal to 0), Scrollk leaves the display alone.

Now let's build Scrollk and see what it does before we try to understand the details of how it works. Hit Q to leave Debug.

The Scroll Lock. Here is the program to build Scrollk.com.

```
10   CHECK=0                          'Check to see if data is
                                      correct
20   FOR I = 1 TO 251
30   READ BYTE
40   CHECK = CHECK XOR BYTE
50   NEXT I
60   IF CHECK=54 THEN 100             'Data okay, so create
                                      Scrollk.com
70   PRINT "One of the data statements may be wrong"
80   PRINT "Check lines 1000-1310, then run again"
90   STOP
100  OPEN "scrollk.com" AS #1 LEN=1
110  FIELD #1,1 AS BYTE$
120  RESTORE
130  FOR I=1 TO 251
140  READ BYTE: LSET BYTE$ = CHR$(BYTE) : PUT #1
150  NEXT I
160  CLOSE
170  PRINT "SCROLLK.COM created"
180  END
1000  DATA 233, 180, 0,   0,   0,   0,   0,   0
1010  DATA 0,   0,   0,   0,   0,   23,  0,   251
1020  DATA 30,  83,  80,  187, 64,  0,   142, 219
1030  DATA 160, 23,  0,   36,  16,  140, 203, 142
1040  DATA 219, 58,  6,   12,  1,   116, 30,  138
1050  DATA 30,  13,  1,   136, 30,  11,  1,   162
1060  DATA 12,  1,   81,  82,  80,  180, 3,   183
1070  DATA 0,   156, 255, 30,  3,   1,   136, 54
1080  DATA 14,  1,   88,  90,  89,  147, 88,  10
1090  DATA 219, 116, 75,  128, 252, 2,   117, 12
1100  DATA 58,  54,  14,  1,   136, 54,  14,  1
1110  DATA 126, 60,  235, 5,   128, 252, 6,   117
1120  DATA 53,  254, 6,   11,  1,   138, 62,  13
1130  DATA 1,   56,  62,  11,  1,   124, 39,  138
1140  DATA 223, 254, 203, 136, 30,  11,  1,   187
1150  DATA 64,  0,   142, 219, 138, 30,  23,  0
1160  DATA 246, 195, 16,  116, 17,  128, 227, 3
1170  DATA 116, 242, 128, 251, 1,   116, 7,   51
1180  DATA 219, 46,  136, 30,  11,  1,   91,  156
1190  DATA 46,  255, 30,  3,   1,   31,  207, 251
1200  DATA 30,  83,  140, 203, 142, 219, 10,  228
1210  DATA 117, 6,   51,  219, 136, 30,  11,  1
1220  DATA 91,  31,  46,  255, 46,  7,   1,   180
1230  DATA 3,   50,  255, 205, 16,  136, 54,  14
1240  DATA 1,   184, 0,   0,   142, 216, 161, 64
1250  DATA 0,   46,  163, 3,   1,   161, 66,  0
1260  DATA 46,  163, 5,   1,   184, 15,  1,   163
1270  DATA 64,  0,   140, 14,  66,  0,   161, 88
1280  DATA 0,   46,  163, 7,   1,   161, 90,  0
1290  DATA 46,  163, 9,   1,   184, 159, 1,   163
1300  DATA 88,  0,   140, 14,  90,  0,   186, 183
1310  DATA 1,   205, 39
```

Run this program to generate Scrollk.com. You'll probably want to save the Basic program, even though you need run it only once to generate Scrollk.com; be sure to save the Basic program under some name other than Scrollk.com, so you won't overwrite the machine-language program.

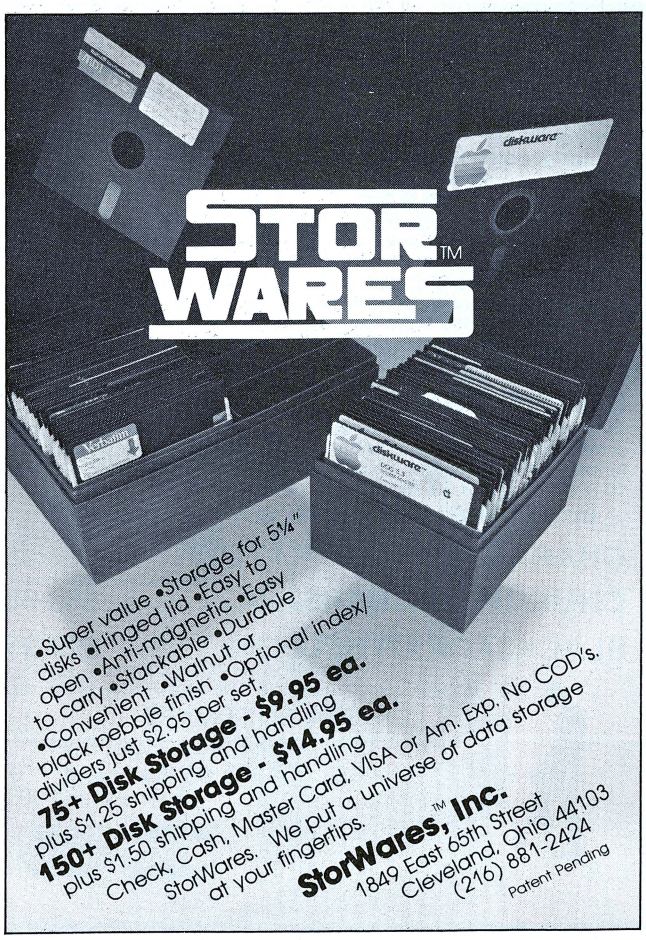
Examining the Lock. That's it. So let's try Scrollk. Type

```
system
A>scrollk
A>
```

Doesn't seem like much, but we've just attached Scrollk to DOS and increased the length of DOS in memory by 448 bytes. We've changed only the version of DOS in memory, not the version on your disk; so you'll have to run Scrollk.com every time you reboot DOS (or put it in an autoexec batch file if you want it to run automatically whenever you boot DOS).

Now let's repeat our simple experiment in Basic to see what we've gained with Scrollk. Go back to Basic and enter

```
10  A = 0
20  PRINT A
30  A = A+1
40  GOTO 20
```



and, while this program is running, hit the scroll-lock key. Poof—the display freezes. Try pushing scroll-lock a few more times to get the feel of it. Scroll-lock is a toggle switch (bit 4 at location hex 417 changes from 0 to 1 or 1 to 0) that turns Scrollk on and off.

Now freeze the display again with scroll-lock and then briefly tap the shift key on the left side of the keyboard. That's right, the one on the left; your pc can tell if a shift key is depressed and can distinguish between the one on the left and the one on the right. Notice what happens. The screen fills with twenty-three more numbers (twenty-three lines) before freezing again. Try this a few more times.

So what of the right shift key? Try it; this key allows you to see more lines, one line at a time, for as long as you hold it down. Experiment a bit with these three keys before exploring in more detail the workings of Scrollk.

The numbers in the example just given fly past very quickly, making it difficult to see how Scrollk works, so let's try this routine.

```
10  K=0
20  PRINT CHR$(63 + (K MOD 26));
30  K=K+1
40  GOTO 20
```

This sends long lines to the screen at a much slower pace. You'll find that Scrollk doesn't freeze the display until the end of a line.

If you're running an interactive program, your pc may display a few lines, read some characters from the keyboard, and then display some more lines. If this were happening, you would want Scrollk to work in such a way that when you hit the scroll-lock key followed by the left shift key, it would freeze the screen only after twenty-three continuous lines of display. That is, you would want it to start counting lines anew each time your program's display stopped of its own accord. That's in fact what it does, as you'll see by the following program.

This program prints a number of lines and then reads another number from the keyboard.

```
10  INPUT "Number of lines";NUMLINES
20  FOR I=1 TO NUMLINES
30  PRINT I
40  NEXT I
50  GOTO 10
```

Try this program a couple of times using 20 as a value for Numlines; then switch to 24 and notice the difference.

The left-shift-key feature of Scrollk.com won't interrupt an interactive session where continuous output never exceeds twenty-three lines. But it will freeze the screen as soon as a program displays more than twenty-three lines of text without reading any characters from the keyboard. Experiment with Scrollk to get a better feel of how this feature works.

Now that you have an idea of the power of Scrollk, let's continue our excavations to see if we can find the information, inside your pc, that tells which shift key has been pushed down.

The Artifacts. Reach into your tool kit (DOS disk) and find Debug again. Debug is a very useful tool for digging into memory. Type

```
A> Debug
-
```

Now begins the fun. First, type

```
-D 40:17 17
0040:0017   00
```

You may see a number other than 00; this just means you have turned on scroll lock, num lock, caps lock, or insert (see figure 1). The rightmost digit should be 0, in any event, and it is this digit that we'll soon see change.

The next step requires some fancy finger work at the end of the line, so just type this line without hitting the enter key:

```
-D 40:17 17
```

Now hold down the left shift key and keep holding it while you press the enter key. You should see

```
0040:0017  02
```

That's it! The second digit changed from 0 to 2 when you held down the left shift; and this digit (in the memory location, not on the screen) won't change back to 0 until you release the left shift key. Let's try the same experiment with the right shift key. You should get

```
-D 40:17 17
0040:0017  01
```

Scrollk simply checks this digit (bits 0 and 1) to see which shift key is being held down and acts accordingly. (Actually, Scrollk sees only the left shift key if both shift keys are pushed, but that's just an "artifact" of the way Scrollk.com's written). Okay, enough of Debug:

```
-Q
A>
```

A Shorter Scroll. Scrollk displays twenty-three lines of new information before it freezes the display; that leaves one line (in Basic, or two lines in DOS) of old information at the top of the screen. What if you want to see only ten lines of new information at a time? Can we change this twenty-three? Yes, and with a very simple Basic program:

```
10   INPUT "Number of lines to print before
        locking";NOLINES
100  DEF SEG = 0
110  DEF SEG= 256*PEEK(&H43)+PEEK(&H42)
120  POKE &H10D,NOLINES
130  END
```

Lines 100 through 120 can be included in any Basic program to

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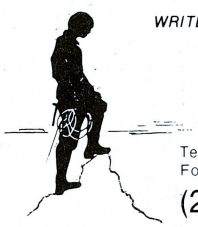

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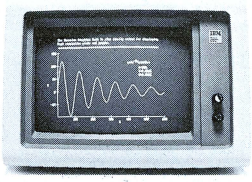

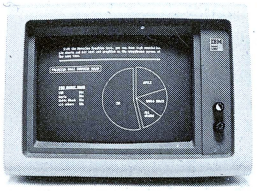

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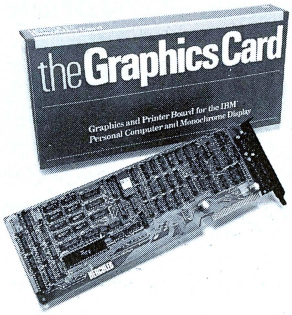

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let you change the scroll length from within a Basic program.

Or you can make a new version of Scrollk.com, with a different scroll length, by changing line 1010 in the Basic program we used to generate Scrollk.com. Simply change the 23 in line 1010 to another number, then rerun the Basic program to create a new version of Scrollk.com.

Now let's see if we can unravel the mystery of Scrollk.

Picking the Lock—How Scrollk Works. There are several machine-language routines in the ROM BIOS that DOS calls upon to display characters on the screen. DOS calls on one routine every time it displays a character, and special characters like carriage return and line feed are treated as you'd expect; carriage return sends the cursor to the beginning of the line and line feed sets it to the next line. This display routine, after a line feed, may have to scroll the screen up to make room for a new line at the bottom. And here is where Scrollk intercepts BIOS calls.

The ROM BIOS routine for character output calls upon the SCROLL_UP routine to scroll the screen up by one line. Scrollk intercepts this call and, before calling SCROLL_UP, checks to see if twenty-two lines have already been scrolled (twenty-three lines of new text). If twenty-three lines of text have been displayed without any characters being read from the keyboard, then Scrollk just waits until you push the left shift, right shift, or the scroll-lock key.

Remember when we tested Scrollk during an interactive session with alternating input and output? How did Scrollk know when the program had read a character from the keyboard? Well, there is another routine in the ROM BIOS that reads characters from the keyboard. Naturally, Scollk intercepts calls to this routine, so that Scrollk knows when any program reads characters from the keyboard. Simple—or so it seems; the program to do all this is a bit long. Here are the technical details.

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Translating the Scroll. Let's first consider

```
BEGIN:   JMP    INIT_VECTORS
```

which is the first executable line in Scrollk. This instruction jumps to the initialization routine, INIT_VECTORS, at the end of Scrollk. INIT_VECTORS is at the end of the program, so it won't stay in memory after executing the INT 27H instruction (for more information on this section, see "Attack of the Printer Bug," by John Socha, *Softalk*, March 1983).

The INIT_VECTORS routine changes the interrupt vectors for keyboard input and video output to point to routines within Scrollk, but it first saves the old addresses in ROM_VIDEO_IO and ROM_KEYBOARD_IO. Then Scrollk can call the ROM routines to do most of the work. Scrollk simply delays calls to the ROM routines, and this is how it freezes the display.

How can Scrollk call the ROM routines? We've changed the interrupt vectors, so Scrollk certainly can't use INT 10H or INT 16H calls. But we can do long JMPs or CALLs. We have to be careful, though. An INT instruction pushes three words onto the stack (the processor status flags, the code segment, and the instruction pointer), whereas a CALL pushes only the last two words. Aha, we just need a PUSHF instruction before the CALL, and if you look in the INTERCEPT_VIDEO routine, you'll see that this is exactly what we have. So now we can intercept all calls to the VIDEO_IO routines and do some work before we hand control over to VIDEO_IO in the ROM.

The rest of INTERCEPT_VIDEO is rather straightforward, although somewhat obtuse, with one exception. There's a bit of code that watches for changes in the cursor's line. Thus, if you do a *cls* in Basic, Scrollk will stop after twenty-three new lines, even though the display hasn't had to scroll up. You'll find the details in INTERCEPT_VIDEO. Yes, it's a bit painful trying to read and understand someone else's assembler program (especially one with spaghetti logic), but you'll probably find it a useful exercise.

INTERCEPT_KEYBOARD is quite simple in comparison to INTERCEPT_VIDEO. Here's a hint: There's a JMP to the ROM routine so that the ROM KEYBOARD_IO routine can set the ZF flag (see page A-23 in the *Technical Reference* manual).

```
;-----------------------------------------------------------------------------------------
; This program intercepts calls to the VIDEO_IO routines. Commands to scroll the screen will be  ;
; intercepted; all others passed through. This routine is attached to DOS.                      ;
;-----------------------------------------------------------------------------------------

;-----------------------------------------------;
; Interrupt vectors for video and keyboard routines  ;
;-----------------------------------------------;
VECTORS SEGMENT AT 0
        ORG     10H*4
VIDEO_INT       LABEL   DWORD
        ORG     16H*4
KEYBOARD_INT    LABEL   DWORD
VECTORS ENDS

;-----------------------------------------------------------------------------------------
; ROM BIOS data area for keyboard                                                          ;
;                                                                                          ;
; Contents of KB_FLAG:                                                                     ;
;<---  ---      ---      ---      ---      ---      ---      --->                          ;
;  ^INS_STATE   ^NUM_STATE   ^ALT_SHIFT   ^LEFT_SHIFT                                       ;
;       ^CAPS_STATE   ^SCROLL_STATE   ^CTL_SHIFT   ^RIGHT_SHIFT                             ;
;-----------------------------------------------------------------------------------------
ROM_BIOS_DATA   SEGMENT AT 40H
        ORG     17H
KB_FLAG         DB      ?               ;Bit 4 set for scroll lock
ROM_BIOS_DATA   ENDS
;-----------------------------------;
; Initialize vectors and attach to DOS. ;
;-----------------------------------;
CSEG    SEGMENT         PARA
        ASSUME          CS:CSEG
        ORG             100H            ;Set starting point for a COM file
BEGIN:  JMP             INIT_VECTORS    ;Initialize INT 10H vector and attach to DOS

;-----------------------------------------------------------------------------------------
; These memory locations store the addresses of the ROM routines for video and keyboard I/O.  ;
;-----------------------------------------------------------------------------------------
ROM_VIDEO_IO            DD              ;Address of the ROM routines
ROM_KEYBOARD_IO         DD
SCROLL_COUNT            DB      0       ;Number of lines scrolled since last pause
LAST_LOCK_STATE         DB      0       ;0 if scroll lock off last time checked
MAX_LINES               DB      23      ;Scroll by 23 lines, leaving one old line
                                        ;at the top of the screen
```

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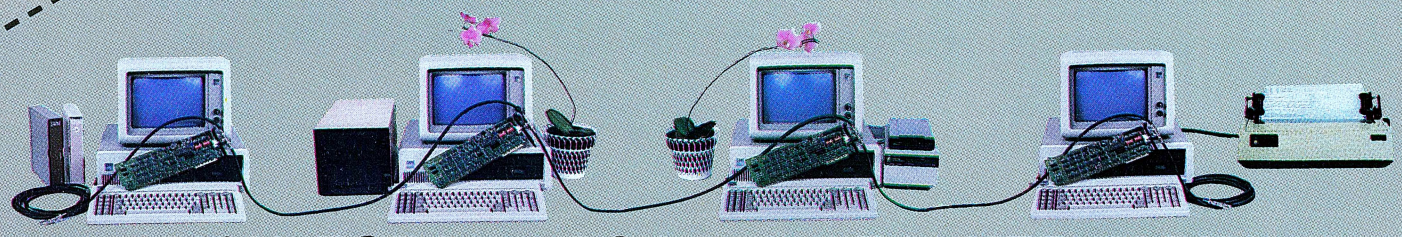

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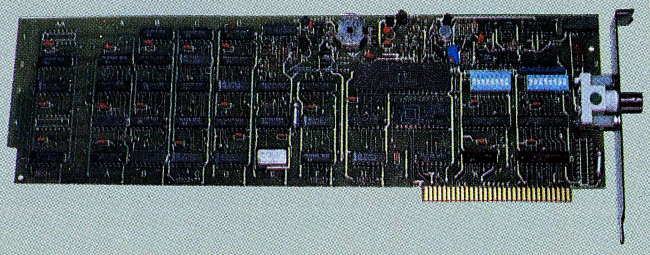

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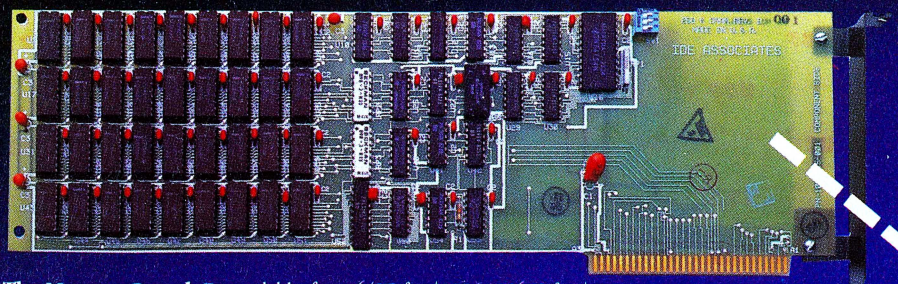

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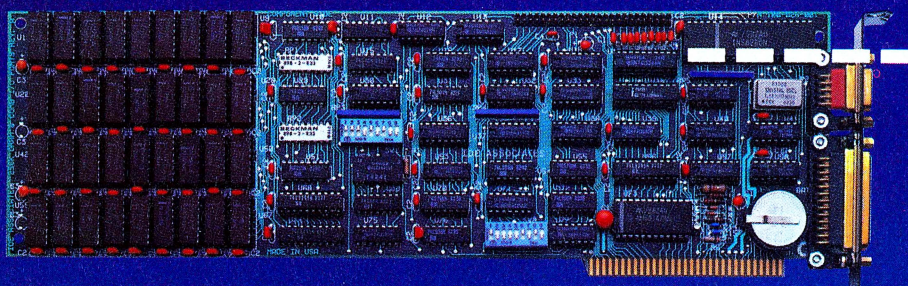

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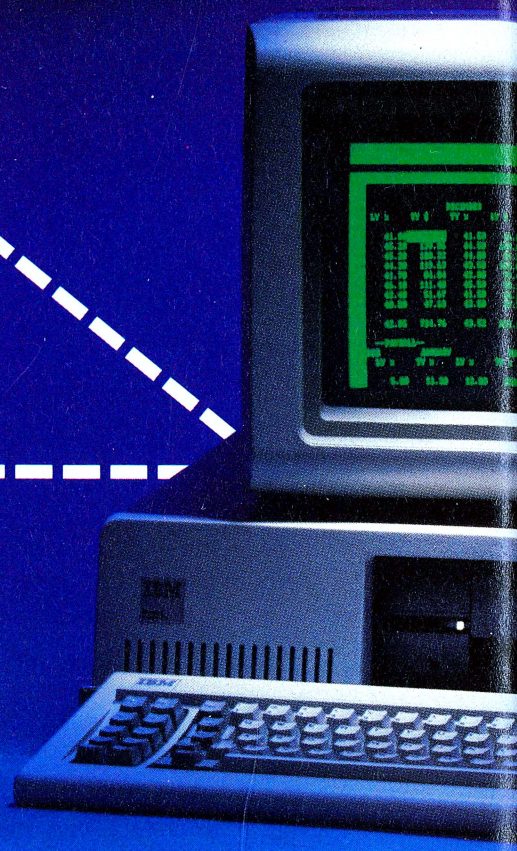

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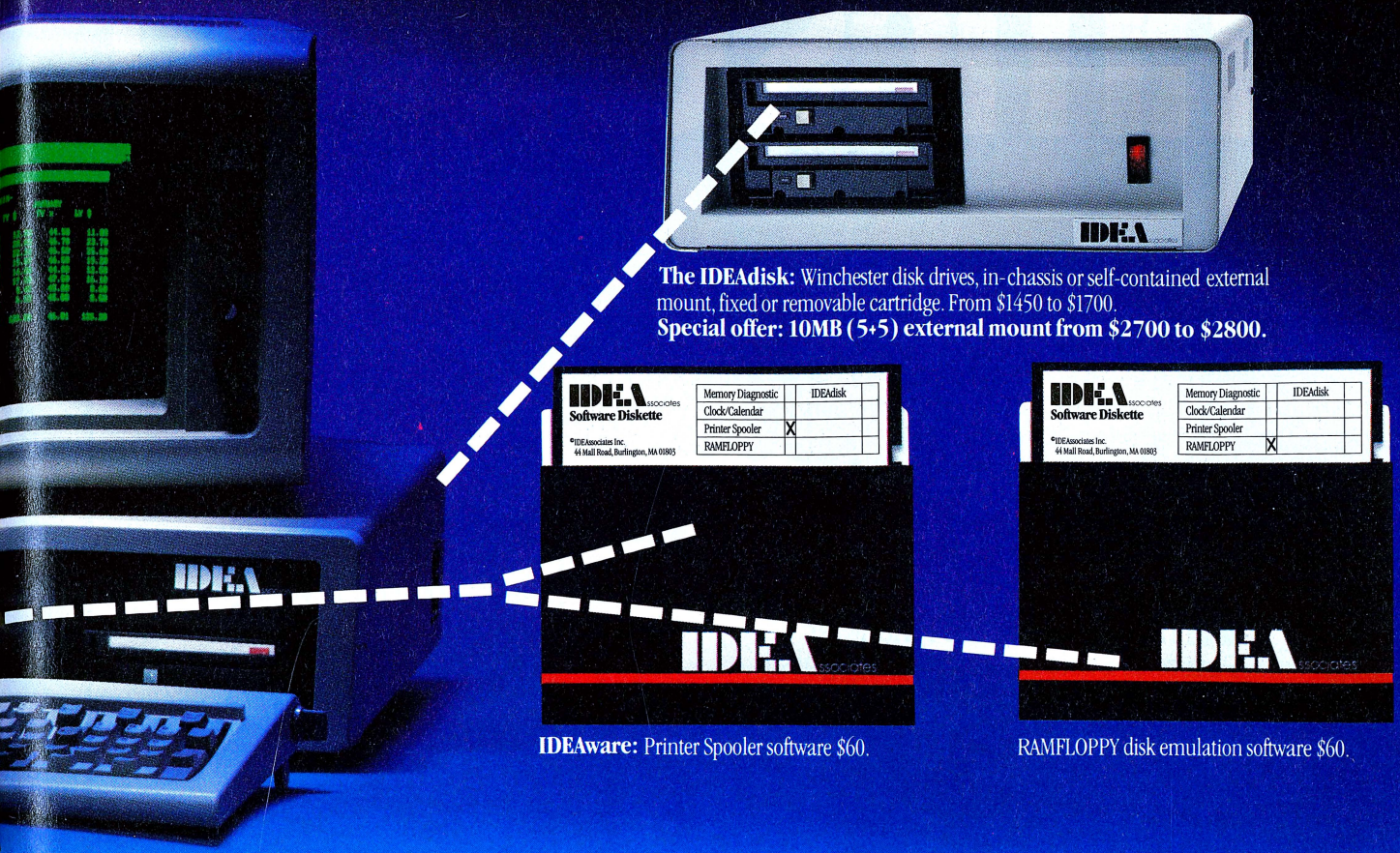

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CIRCLE 241 ON READER SERVICE CARD

```
LAST_LINE               DB                      ;Last line the cursor was on
; ---------------------------------------------------------------------------;
; This routine intercepts all calls to the VIDEO_IO routine in the ROM.      ;
; Scroll Lock:                                                               ;
;     OFF                 This routine passes control directly to the ROM BIOS ;
;                         routine.                                           ;
;     ON                  Functions other than SCROLL UP or SCROLL DOWN are  ;
;                         passed directly to the ROM routines. Otherwise, this ;
;                         routine increments the scroll count and checks to see ;
;                         if it exceeds the page size of 25 lines. If so, loop ;
;                         until either shift key pressed.                    ;
;                                 left shift allows scroll of whole window   ;
;                                 right shift of one line.                   ;
; ---------------------------------------------------------------------------;

INTERCEPT_VIDEO         PROC    FAR
        ASSUME  CS:CSEG
        STI                     ;Turn on interrupts again
        PUSH    DS              ;Save registers used
        PUSH    BX
        PUSH    AX

        ASSUME  DS:ROM_BIOS_DATA
        MOV     BX,ROM_BIOS_DATA
        MOV     DS,BX
        MOV     AL,KB_FLAG              ;Check state of scroll lock key
        AND     AL,10H                  ;Pick off scroll-lock bit
        ASSUME  DS:CSEG
        MOV     BX,CS                   ;Data Segment for variables (above)
        MOV     DS,BX
        CMP     AL,LAST_LOCK_STATE
        JE      UN_CHANGED              ;Scroll-lock key hasn't changed
        MOV     BL,MAX_LINES            ;Scroll-lock key has changed, set
        MOV     SCROLL_COUNT,BL         ;to MAX_LINES to stop scrolling
        MOV     LAST_LOCK_STATE,AL      ;Save the new scroll-lock state
        PUSH    CX                      ;Now read current cursor position and
        PUSH    DX                      ;save in LAST_LINE so SCROLLK won't
        PUSH    AX                      ;freeze in the middle of a line
        MOV     AH,3
        MOV     BH,0
        PUSHF
        CALL    ROM_VIDEO-IO            ;Find old cursor position
        MOV     LAST_LINE,DH            ;and save in LAST_LINE
        POP     AX
        POP     DX
        POP     CX
UN_CHANGED:
        XCHG    AX,BX           ;Recover function (AH) and retain scroll lock
        POP     AX
        OR      BL,BL           ;Is scroll lock on?
        JZ      TO_VIDEO_IO     ;No, jump to the ROM Video_IO routine
        ; ---------------------------;
        ; Scroll Lock ON             ;
        ; ---------------------------;
        CMP     AH,2            ;Check for SET CURSOR POSITION function
        JNE     NOPE
        CMP     DH,LAST_LINE    ;Is the cursor being moved to the next line?
        MOV     LAST_LINE,DH            ;Save new cursor line
        JLE     TO_VIDEO-IO             ;No, jump to ROM routine
        JMP     SHORT CHECK_LOCK                ;Yes, see if need to lock
NOPE:   CMP     AH,6                    ;Scroll up?
        JNE     TO_VIDEO_IO             ;No, go to ROM routines
CHECK_LOCK:
        INC     SCROLL_COUNT            ;Take care of scroll lock
        MOV     BH,MAX_LINES
        CMP     SCROLL_COUNT,BH         ;Have we scrolled more than MAX_LINES?
        JL      TO_VIDEO_IO             ;Nope, it's okay to scroll
                                        ;Yes, can't scroll until one of shift keys hit
        MOV     BL,BH                   ;Set SCROLL_COUNT to MAX_LINES-1
        DEC     BL                      ;so we can print one more line
        MOV     SCROLL_COUNT,BL
        ASSUME  DS:ROM_BIOS_DATA
        MOV     BX,ROM_BIOS_DATA
        MOV     DS,BX
LOOP:   MOV     BL,KB_FLAG              ;Wait until left or right shift key pushed
        TEST    BL,10H                  ;Is scroll lock still on?
        JZ      TO_VIDEO_IO
        AND     BL,3                    ;Pick off shift key info
        JZ      LOOP                    ;Stay in loop until a shift key pushed down
        CMP     BL,1                    ;Right shift key hit?
        JE      SCROLL_LINE             ;Yes, allow scroll of one line
                                ;No, must be right shift key, so reset scroll count
        XOR     BX,BX
        MOV     SCROLL_COUNT,BL
SCROLL_LINE:

TO_VIDEO_IO:
        POP     BX                      ;Restore BX register
        PUSHF
        CALL    ROM_VIDEO_IO
        POP     DS
        IRET                            ;Return
INTERCEPT_VIDEO         ENDP

; ---------------------------------------------------------------------------;
; If the keyboard function calls for a read (AH = 0) then reset the scroll count. ;
; ---------------------------------------------------------------------------;
INTERCEPT_KEYBOARD      PROC    FAR
        ASSUME  CS:CSEG,DS:CSEG
        STI                             ;Turn interrupts back on
        PUSH    DS                      ;Save registers used by this routine
        PUSH    BX
        MOV     BX,CS                   ;Set up data segment for variables
        MOV     DS,BX
        OR      AH,AH                   ;Check to see if AH = 0 — read character
        JNZ     KB1                     ;Nope, just branch off to keyboard I/O
        XOR     BX,BX                   ;Yes, set scroll count to 0
        MOV     SCROLL_COUNT,BL
KB1:    POP     BX                      ;Restore BX register
        ASSUME  DS:NOTHING
        POP     DS
        JMP     ROM_KEYBOARD_IO         ;Jump to keyboard routine and return directly
                                        ;to the routine that called this routine
INTERCEPT_KEYBOARD      ENDP
; ---------------------------------------------------------------------------;
; This section of code saves the old interrupt vectors for the keyboard and video I/O routines. These ;
; vectors are replaced by the addresses of INTERCEPT_VIDEO and INTERCEPT_KEYBOARD.                    ;
; ---------------------------------------------------------------------------;
INIT_VECTORS            PROC    NEAR
        ASSUME  CS:CSEG,DS:CSEG
        MOV     AH,3                    ;Set LAST_LINE to cursor line number
        XOR     BH,BH
        INT     10H
        MOV     LAST_LINE,DH

        ASSUME  CS:CSEG,DS:VECTORS
        MOV     AX,VECTORS
        MOV     DS,AX

        MOV     AX,VIDEO_INT            ;Save the address of the ROM routines
        MOV     ROM_VIDEO_IO,AX
        MOV     AX,VIDEO_INT[2]
        MOV     ROM_VIDEO_IO[2],AX
        MOV     AX,OFFSET INTERCEPT_VIDEO       ;Set video INT 10H to point to
        MOV     VIDEO_INT,AX            ;INTERCEPT_VIDEO above.
        MOV     VIDEO_INT[2],CS

        MOV     AX,KEYBOARD_INT         ;Save the address of the ROM routines
        MOV     ROM_KEYBOARD_IO,AX
        MOV     AX,KEYBOARD_INT[2]
        MOV     ROM_KEYBOARD_IO[2],AX
        MOV     AX,OFFSET INTERCEPT_KEYBOARD    ;Set keyboard INT 16H to point
        MOV     KEYBOARD_INT,AX         ;to INTERCEPT_KEYBOARD above
        MOV     KEYBOARD_INT[2],CS

        MOV     DX,OFFSET INIT_VECTORS ;End of resident portion
        INT     27H                     ;Terminate but stay resident
INIT_VECTORS            ENDP

CSEG    ENDS

        END     BEGIN
```

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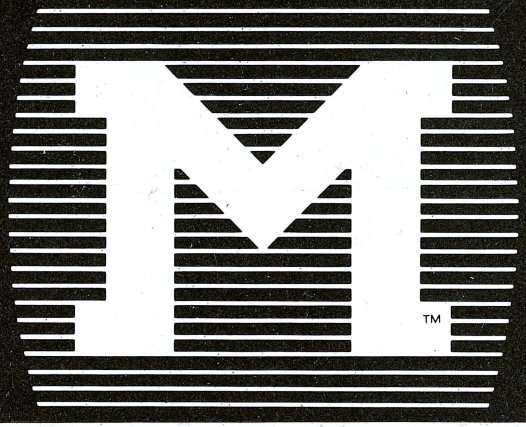

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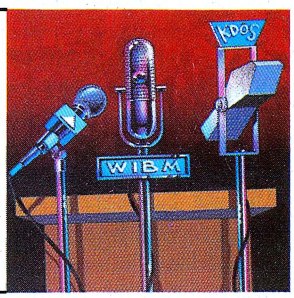

Unless otherwise indicated, software listed runs in DOS on machines with either display adapter and requires 64K and at least one disk drive.

Δ **Phoenix Performance Systems** (324 South Main Street, Suite 1, Stillwater, MN 55082; 612-430-2980) has announced a system called *The Author* that creates self-instructional training courses on any subject. Produce menus, four types of question screens, and narrative instructional screens. Complete records for each learner who studies a lesson can be displayed and printed. $195.

Δ The first system in its international finance series has been released by **Nissim Associates** (2714 Pine Street, San Francisco, CA 94115; 415-563-6170). *The Multi-Currency General Ledger* is intended for the international bank or corporate branch doing business in more than one currency. Provides financial information by individual currency, consolidates balance-sheet and income-statement data in different currencies into a single report, and automatically revaluates foreign currencies to current rates. Requires two disk drives. $3,800.

Δ *SimpliSoft* is a front-end system for CP/M, PC-DOS, and CP/M-86, from **Durant Software** (2532 Durant Avenue, Suite 250, Berkeley, CA 94704; 415-540-0912). Logically displays file information, including user's own forty-two-character file description. Loads and runs other programs from a menu of program names. $100.

Δ *Micro Cookbook* is a cookbook and recipe management system that retrieves recipes by name, category, or ingredients on hand. Enter your own recipes, alter any of the 154 existing ones, and print shopping lists. Optional soup and salad and appetizer disks available. From **Virtual Combinatics** (Box 755, Rockport, MA 01966; 617-546-6553). $40.

Δ *Reformatter* is a utility program that gives CP/M-86 users access to IBM 3740 formatted disks. Handles all conversion functions, and allows the transfer of files back and forth. From **MicroTech Exports** (467 Hamilton Avenue, Suite 2, Palo Alto, CA 94301; 415-324-9114). Requires eight-inch drive. $350.

Δ Three educational packages from **Europro** (129 Saratoga, Petaluma, CA 94952; 707-763-9700): *Edubase I* teaches you how to write Basic. Includes flowcharting, subroutines, and debugging. On three disks. Requires color/graphics adapter and eighty-column screen. $95. Δ *Edubase II* unlocks the advance functions of Basic programming, including string and substring manipulations, file manipulations (sequential and random), and graphics and color. On three disks. Requires color/graphics adapter and eighty columns. $105. With *Edubase I*: $170. Δ *TMGame* is a fun way for kids and adults to sharpen their math skills. Requires color/graphics adapter and eighty columns. $30.

Δ A direct connection between the pc and the IBM mainframe 43XX through 30XX series is now possible with Forte PC78-2, a hardware interface from **Forte Data Systems** (1500 Norman Avenue, Santa Clara, CA 95050; 408-980-1750). Includes operating software. $150.

Δ *Miner 2049er* is a gold mine of arcade fun from **Micro Lab** (2310 Skokie Valley Road, Highland Park, IL 60035; 312-433-7550). Run, jump, and slide through mines; reinforcing the groundwork along the way. Elevators, cannons, chutes, and ladders will help you; mutants won't. $40.

Δ Those microscopic bugs in *Microcosm*, the strategy game from **Aeon Concepts** (1657 Red Mill, Pittsburgh, PA 15241; 412-831-5352), have been corrected. Version 3.0 also runs up to thirty-seven times faster and supports all colors on sixteen-color monitors. Requires 96K and double-sided disk on 2.0.

Δ A run-time version of SofTech's p-System is available from **IBM** (Box 1328, Boca Raton, FL 33432; 800-447-4700). $50.

Δ An enhanced version of *Informa X* information management system has been released by **Abacus Data** (1920 San Marco Boulevard, Jacksonville, FL 32207; 800-874-8555). The new version is written in Pascal and features cross-file data-sharing, multiple-file reporting, multiple screens per record, broader application capabilities, increased speed and security. $795. Multiuser version: $995.

Δ Apple software can run on a pc or XT using the Quadlink multifunction board from **Quadram** (4357 Park Drive, Norcross, GA 30093; 404-923-6666). The board translates Apple DOS 3.3 into a language the pc can understand; simply load the disk and key in one command. $680.

Δ Turn clicks into commands with the PC Mouse from **Mouse Systems** (2336H Walsh Avenue, Santa Clara, CA 95051; 408-988-0211). Up to fifteen key sequences can be assigned to each button code. Package includes optical mouse, mouse pad, RS-232 interface box and connector, DC power converter, and software interface. $332. Δ *MouseWindow* is a software development package for line drawing, RasterOp operations, and more. $40.

Δ An extended version of the disk file organizer, *HelpWare-XT*, from **SoftWrights** (12606 Greenville Avenue, Suite 100, Dallas, TX 75243; 214-690-0595), supports fixed disks or shared disk systems in local area networks. Includes instant access to directories, single-keystroke commands, screen editor, and more. $245. Δ *CommWare* is a general purpose communications program designed to interface with other micro, mini, or mainframes. Half or full duplex; 110 to 9600 baud. $145.

Δ *The Seybold Report on Professional Computing* is a thorough and well-written business system newsletter that covers one system in depth per issue. Examples: word processors for the pc, Lisa, *1-2-3*, Context *MBA*. Published six times a year by **Seybold Publications** (Box 644, Media, PA 19063; 215-565-2480). $60 per year.

Δ A Computer authoring system aimed at the educational and industrial training market has been developed by **TexaSoft** (3415 Westminster, Suite 100, Dallas, TX 75205; 214-369-0795). *Call* takes advantage of the pc's sound, color, and character graphics. An editor, a grading program, and other utilities are included in the package. Requires 128K and two disk drives. $395. Δ *Your Personal Computer Tutor* gives instruction of the care and use of your machine while teaching some computer fundamentals. $60.

Δ **Associated Technology** (Route 2, Box 448, Estill Springs, TN 37330; 205-837-4718) has announced a guidebook called *How To Become a Successful Technical Consultant*, edited by M. Neighbors, a systems and software consultant. Includes discussions on locating clients, fees, ethics, setting business goals, and writing contracts. $25.

Δ A set of software design standards has been published by **Associated Technology** (Route 2, Box 448, Estill Springs, TN 37330; 205-837-4718). Useful in establishing internal programming and documentation practices, the four-volume set covers documentation practice and standards for programming in Cobol, Fortran, and Basic. $45.

Δ Produce presentation-quality 35mm slides or photographic prints of your video displays with Video Printer from **Computer-Mate** (1006 Hampshire Lane, Richardson, TX 75080; 800-527-3643). Many features are totally automatic; simple controls adjust chroma, brightness, contrast, and raster. Uses standard 35mm film. $2,495.

Δ A regular series of Boston-area workshops will offer professional training to the public on the *MMSForth* word processor, database management, and communication packages. Offered by **Miller Microcomputer Services** (61 Lake Shore Road, Natick, MA 01760; 617-653-6136). Programming ability not required. Call for starting dates. $150 to $250 per workshop.

Δ Accessories from **Compu-Quote** (6914 Berquist Avenue, Canoga Park, CA 91307; 213-348-3662): Qwik-key is a plastic overlay card that fits over the function keys and can be marked to indicate key's use. Pack of three: $4.50. Δ Qwik-Guide are two reference cards that contain all DOS commands, Basic error messages, and control/function key information. $3.25. Δ Qwik-labels help to identify plug-in cards, knobs, and connectors. Mark-your-own blanks included. Eighteen labels: $1.

Δ *ReadiWriter* is a word processor with powerful formatting capabilities, compatibility with the IBM mainframe document composition facility GML and Script languages, and a self-extension feature for building new commands. No limit to file size; compatible with most printers. From **ReadiWare Systems** (Box 680, West Redding, CT 06896; 203-431-3521). $95.

Δ The *Stud Poker Parlor*, from **QSI Software** (Box 3-231 ECB, Anchorage, AK 99501; 907-265-8187), is a no-frills simulation game that plays five or seven-card-stud poker. $29.95.

Δ A plug-in telecommunications card, PConnection, with a direct-connect modem, a real-time clock, and an additional serial I/O port is available from **Microperipheral** (2565 152nd Avenue N.E., Redmond, WA 98052; 206-881-7544). Totally self-contained; only the cord to the phone line is external. $375.

Δ *Coin Inventory System* keeps track of all purchases and sales in completed and uncompleted form for coin dealers, brokers, investors, and hobbyists. From **Dennis Charles Smart** (6840 Seagull Lane, New Orleans, LA 70126; 504-245-8439). Prints and displays eight kinds of reports. Requires two disk drives. Requires 1.1. $499.

Δ The *Sweet-P* plotter works on paper or overhead transparency film; has programmable plotting speed; and comes with basic analytical engineering and business graphics software. From **Enter Computer** (6867 Nancy Ridge Drive, Suite D, San Diego, CA 92121; 619-450-0601). $795.

Δ **Royal Seating** (Box 753, Cameron, TX 76520; 817-697-6421) has designed a set of computer furniture especially for the pc. The Modular Microsystems feature walnut-woodgrain plastic tops, sturdy steel frame construction, and options for a variety of configurations. From $92 to $225.

Δ A two-disk collection of more than fifty Basic and *VisiCalc* spreadsheet programs can be found in *The Executive Package*, from **Alpha Software** (6 New England Executive Park, Burlington, MA 01803; 617-229-2924). Based on the book *Executive Computing*, by John M. Nevison, the *VisiCalc* disk is also compatible with *1-2-3* and *Multiplan*. $145.

Δ **IBM** (Box 1328, Boca Raton, FL 33432; 800-447-4700) has announced that, beginning with current production, a new system board containing 64K of user memory will be featured in all American and Canadian-made pcs. With the use of memory cards, maximum addressable memory may be increased to a total of 640K.

Δ An integral Bell 212-compatible modem with integrated voice and data capability, as well as communication at 300 or 1200 baud has been announced by **BizComp** (Box 7498, Menlo Park, CA 94025; 408-745-1616). The PC:IntelliModem allows programmatic switching between voice and data without redialing. Auto dial, auto-repeat dial, and auto answer included. $499.

Δ The *Datatext* word processor features embedded English commands to format text, true proportional spacing with justification by character, and generation of alphabetized indexes. Files created with *dBase II* can be merged with text. From **Datatek** (2621 Enterprise Road, Clearwater, FL 33515; 813-797-6464). $450.

Δ A collection of more than fifty programs and techniques for programmers called *Peeks 'n' Pokes for the IBM Personal Computer* is offered by **Data Base Decisions** (14 Bonnie Lane, Atlanta, GA 30328; 404-256-3860). Includes general-purpose assembler routines in both Basic and Pascal. Requires eighty columns. $30.

Δ In three cassette lessons of two hours each, *How To Use WordStar* guides a novice through the commands and capabilities of the popular word processor. Additional topics and additional learning reinforcement are provided on the flip side of the tape. From **FlipTrack Learning Systems** (526 North Main Street, Glen Ellyn, IL 60137). $49.95.

Δ **Peter Norton** (2210 Wilshire Boulevard, Santa Monica, CA 90403; 213-399-3948) has not been sleeping: Version 2.00 of the *Norton Utilities* has been announced, with improvements. Utilities work with the new formats; hard disk versions of the key utilities and three new routines have been added. $80. Upgrade: $20. Δ If you enjoyed Peter Norton's articles from his book, *Inside the IBM/PC*, you can now order it. Available with it is an *Access Set* of programs to help you explore your machine. $20. Book and disk: $80.

Δ *Metafile* is a comprehensive information management system integrating database management, word processing, spreadsheets, forms generation, communications, report generation, and applications development. Combine information into multiple screen windows to form composite reports. From **Sensor-based Systems** (Olmstead Federal Building, Chatfield, MN 55923; 507-867-4440). $1,995.

Δ Transfer Basic, text, and *VisiCalc* files from the Apple II with *Tie-Line* software from **Trax** (8948 West Twenty-fourth Street, Los Angeles, CA 90045; 213-670-9699). No adapter or interface required; supplied cable links the two machines. $170.

Δ A cost accounting and project management system for architectural and engineering firms and related industries is available from **Computer Applications** (2400 Poplar Avenue, Suite 318, Memphis, TN 38112; 901-458-8630). *Cost-Acumen* features extensive internal cross-checks. Requires CP/M-80 or CP/M-86. $995. Demo: $95.

Δ The *Volkswriter International Edition* is available for those who correspond or do business in more than one language. **Lifetree Software** (411 Pacific Street, Suite 315, Monterey, CA 93940; 408-373-4718) has designed this special version of its word processor to write in English, French, German, Spanish, and Italian interchangeably. $225. Δ Also released is the charter issue of the *Lifetree National Newsletter*, which will be distributed to *Volkswriter* owners and dealers. Δ Hot News: *Volkswriter 1.2* runs with DOS 2.0 on the XT.

Δ *Spectra/Medical* is a medical office management system for practices of up to fifteen doctors, from **Spectra Soft** (Box 277, Chandler, AZ 85224; 602-963-6380). Features include total accounts receivable control with open items or balance forward capabilities, variable period aging reports, delinquency notices, daily cash reports, journal and day sheets. Multiple patient entering and accessing; six complete insurance forms included (AMA, Blue Shield, Medicare), printed for interim or period-to-date transactions. Requires XT. $2,495.

Δ An expansion memory board, the Versa-Ram MT512-XIB, ex-

pands memory while serving as a data buffer or electronic floppy disk and print spooler. From **Memory Technologies** (4343 Grand Prix Drive, Logansport, IN 46947; 219-722-1454). 64K: $399. 512K: $1,169. Δ The Versa-Ram Plus multifunction expansion board is designed to be used as a memory and communications adapter for the pc, networking hardware, and printer/plotter driver. 64K: $565. Δ The Versa-Ram MT64MX and MT192NX are two plug-in memory expansion boards. Software included. 64K: $299. 192K: $449.

Δ Trend-spotting tool: **BusiSoft** (6140 Horseshoe Bar Road, Loomis, CA 95650; 916-652-9227) has introduced the *BusiSoft Analyzer*, a financial-statement-analysis program that gives a large variety of ratios derived from information entered from company balance sheets and records. Enter data from more than one financial period; column provided for industry averages. $199.

Δ **Computer Creations** (Box 38, Palo Alto, CA 94302; 415-595-4466) has developed *Ultimate*, a word processor that's also a database manager, twelve-thousand-word dictionary, and mail-merge program. $385.

Δ Format text and data simultaneously with *WordPlan*, from **DEA Software** (Box 968, Fremont, CA 94537; 415-471-9752). Program makes it possible to perform calculations on variables embedded within text. Ideal for proposals, price lists, and form letters. Requires CP/M-86. $195.

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Δ Emulate the Hewlett-Packard 2622A CRT terminal with *PC 2622* software from **Walker Richer and Quinn** (Lake Union Place, 1914 North Thirty-fourth Street, Suite 201, Seattle, WA 98103; 206-634-0503). Uses all available pc memory and supports up to 640K of displayed memory. Function key definitions and labels may be downloaded from host V-3000 system or defined through keyboard. $295.

Δ *Information Please* is a database management system compatible with *VisiCalc* and *MultiPlan*. Performs column math, sorts, alphabetizes, stores, organizes, and so on; stores up to ten charts per file drawer; print sideways. From **MicroRIM** (1750 112th Avenue N.E., Bellevue, WA 98004; 206-453-6017). $295.

Δ A micro version of the timesharing *Prophit II* financial modeling system will be marketed by **Software Libraries** (Box 844, Pasadena, CA 91102; 213-793-1700). A module of *The Business Library*, the package has a capacity of 400 actual available report lines of 120 columns, with fifteen additional totaling columns available. Includes graphics capabilities. Available in July. $695.

Δ Database management software for the XT has been introduced by **Continental Software** (11223 South Hindry Avenue, Los Angeles, CA 90045; 213-417-8031). *Megafile* combines filing, graphics, and reports features and is compatible with both *VisiCalc* and *WordStar*. $195. Δ XT and pc owners can both use the general ledger module of the *SBA* series, compatible with *VisiCalc*, *1-2-3*, *dBase II*, and *WordStar*. Additional modules to be announced. $395.

Δ **Interactive Tele-Marketing** (936 Dewing Avenue, Heritage Square, Suite E, Lafayette, CA 94549; 800-334-3404) is a membership organization that provides software information, selection, and buying. Telephone access to experts, special software reports, monthly newsletter, catalogs, and detailed product reviews are all part of the service. $100 per year.

Δ *The Foresight Data Manager*, from **The Foresight Group** (Box 5196, 728 Sam Hill, Irving, TX 75062; 214-256-2051), can convert files from other database systems without rekeying, offers up to forty-eight key fields per record, produces reports, and more. $199.95. Δ Spreadsheet template planners are available for *VisiCalc*, *SuperCalc*, *Multiplan*, and *1-2-3: Financial Planner*. $79.95. Δ *Tax Planner*. $119.95. Δ *Real Estate Planner*. $129.95.

Δ Two new softcover publications from **Sybex** (2344 Sixth Street, Berkeley, CA 94710; 415-848-8233): *Doing Business with Pascal*, by Richard Hergert and Douglas Hergert, explains the necessary Pascal language extensions, program development, and system integration for special applications. Includes listings and sample runs. $15.95. Δ *Doing Business with SuperCalc*, by Stanley R. Trost, includes more than forty applications for accounting and management planning, from financial statements to master budgets and investment strategies. $12.95.

Δ Simplify the incorporation of graphic data into a word processor text file with *Grids*, enhancement software from **ATC Software** (Route 2, Box 448, Estill Springs, TN 37330; 205-837-4718). Includes more than fifty of the most commonly used graph paper formats with instructions on creating hundreds more. $23.

Δ Four-color text displays are available in the *ColorBIZ* line of business and entertainment packages from **ColorCorp** (208 North Berkshire, Bloomfield Hills, MI 48013; 313-335-2255). *Inventory* is an interactive database and report generator for situations such as multiple stores, dual item or part numbers, location sizes, and so on. $498. Δ *Loan* can analyze numerous financial alternatives. $30. Δ *BioRhythm* can help you exploit your natural body rhythms. $27. Δ *Gambler* is a casino games package, including blackjack, baccarat, and keno. $28.

Δ The Mark VI is a modem with 300 baud, Bell 103 compatibility, tone and pulse dialing, and full auto-answer/auto-dial programmability. From **Anchor Automation** (6624 Valjean Avenue, Van Nuys, CA 91406; 213-997-6493). Fits into the System Unit; software included. $279.

Δ The *PFS:Sampler* is a thirty-four-page collection of forms and related reports created by a cross section of *PFS:File* and *PFS:Report* owners. Forms in the book are organized by industry and profession and are cross-referenced by applications in the index. Published by **Software Publishing** (1901 Landings Drive, Mountain View, CA 94043; 415-962-8910). Free.

Δ *The Running Log* stores and analyzes running data. Log items include miles, time of day, temperature, course, pace, shoes worn, and so on. Suitable for all levels of runners. DOS 1.1, two disk drives, eighty columns, and color/graphics adapter required. From **Marathon Software** (Box 26 Pinecrest, Clancy, MT 59634; 406-933-5783). $44.95.

Δ *Ideal APL*, by Dr. Navin Mehta, author of TIS-APL, is written for the professional APL programmer and includes features found on mainframe systems. Includes full screen editing, page input, control over color, sound, graphics, and so on. From **Ideal Computer Systems** (68 Robie Street, Fundy Trail Mall, Truro, Nova Scotia, Canada B2N 1K8; 902-895-8062). $495. Limited educational version: $295.

Δ **The Forth Interest Group** (Box 1105, San Carlos, CA 94070; 415-962-8653) is a worldwide organization of more than thirty-five hundred members in thirty chapters. It publishes the *Forth Dimensions* newsletter six times a year to keep members informed of news, applications, and recent developments of the language. Periodic meetings held. Membership: $15 per year.

Δ Build your own interface with compatible breadboards from **Douglas Electronics** (718 Marina Boulevard, San Leandro, CA 94577; 415-483-8770). General-purpose breadboard has space for mounting ICs in combinations of various sizes. $35. Δ Wire-wrap panel has space for up to eighty-five sixteen-pin wire-wrap sockets. $30. Δ Bare extender board: $25. Without connector installed: $20. Connector only: $7.50.

Δ The MicroKart is a flexible workstation available in three wood grain finishes; has sides that lift to tables; rear slot for paper feed; and caster wheels for mobility. From **Future Solutions** (3198-H Airport Loop Drive, Costa Mesa, CA 92626; 714-556-2252). $499.95.

Δ Cards from **Sigma Designs** (2990 Scott Boulevard, Santa Clara, CA 95050; 408-496-0536): The 256+Async memory and communications board allows you to use both the memory and rear connector panel space. $695. Δ The system support card provides parallel printer port, asynchronous communications, game control adapter, and battery-powered clock/calendar. $295. Δ The stack board makes available up to 512K memory when piggybacked with enhanced support card. $195, without memory. Δ The enhanced support card is a five-function board, including serial port, printer parallel port, and game adapter. $575. Δ The Floppy+Clock can run up to four disk drives, either single or double sided. $265.

Δ Make any desk a workplace for your pc with the Step Down, an aluminum extension surface in three colors, available in custom sizes. From **Computer Products Unlimited** (331 South River Drive, Suite 10, Tempe, AZ 85281; 602-941-0935). $59.95.

Δ Put your expansion memory piggyback on an I/O board with Extend-A-Slot, an extension kit from **Tamac Electronics** (1028 Fleetwood Drive, San Jose, CA 95120). For IBM-manufactured boards only. $13.75.

Δ **Cornucopia** (Suite 840, 55 Sutter Street, San Francisco, CA 94115) is offering unprotected programs for those interested in building a library of inexpensive software. See the program for five to ten dollars, pay the balance if you like it. Write for catalog.

Δ Five program modules, including disk copy and print formatter, are available in *PC-System Utility Pak*, from **Cortland Data Systems** (Box 14414, Chicago, IL 60614; 312-549-2029). $39.95. Δ Three new arcade games: *The Exterminator* (like *Centipede*), *Magic Circle*, and *Chicken Little*. $29.95 each. Δ Also, the company has introduced *Electronic Checkbook*, a home and small business financial management system. Generate budget and audit reports; print reports in either 80 or 132 column. $120. ▲

The Executive Secretary

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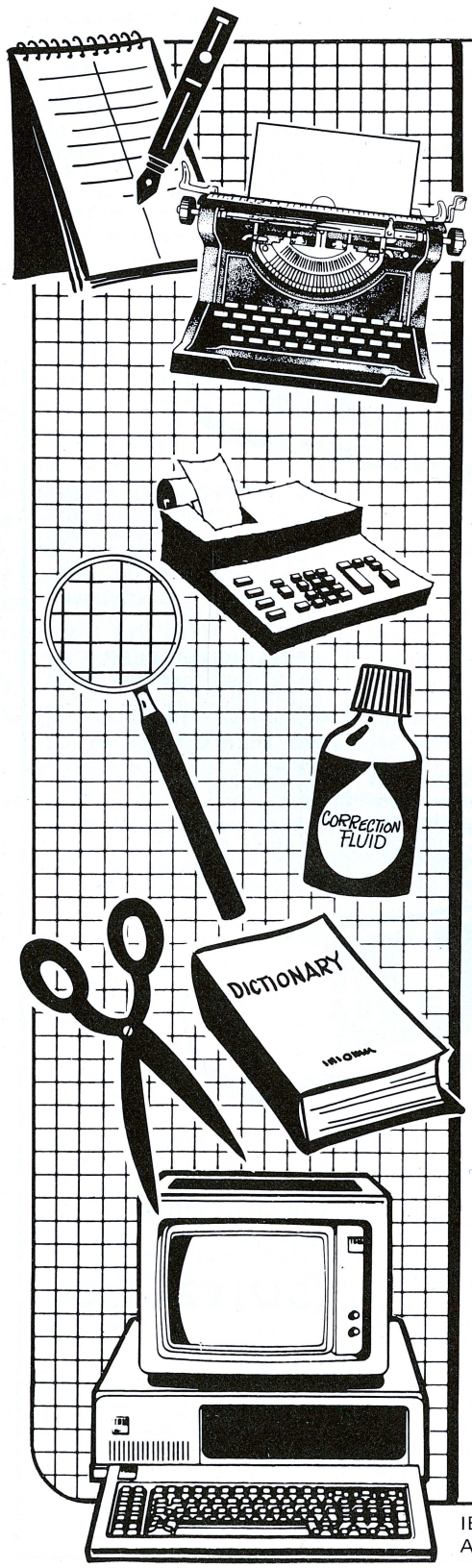

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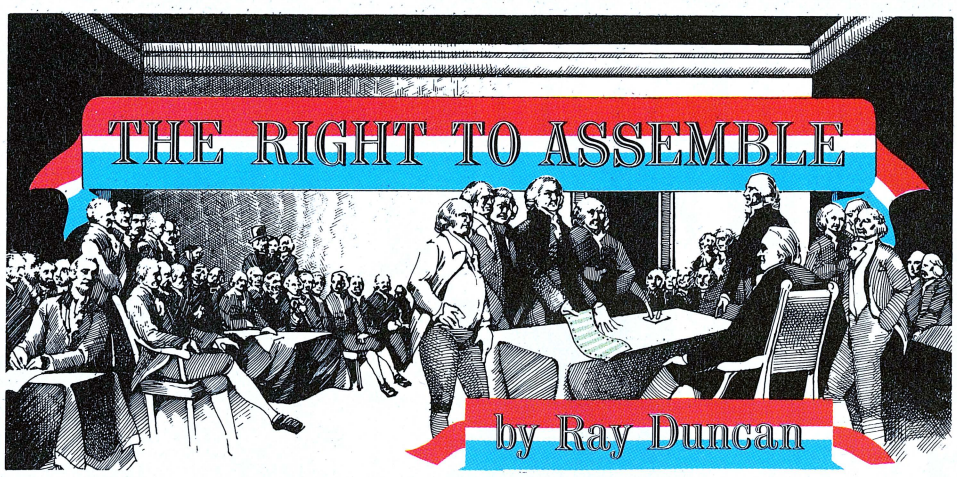

Before investigating further the details of memory addressing on the Intel 8088 microprocessor, we'll digress this month to the interesting topic of interrupts. This is a subject that frequently and unnecessarily intimidates assembly language programmers.

Let us ponder the common telephone as a model for the operation of interrupts. The ringing of the phone, whether you view it as welcome or obnoxious, alerts you to the fact that someone has information to deliver to your particular node of the vast Bell network. You can abandon your present task immediately to pick up the handset, let the phone continue to ring briefly while you quickly bring some chore to a natural stopping point, or choose not to answer at all if you deem whatever else you're doing to be more important. If you consider your work to be really critical and you don't even want to be distracted by the mere noise of the telephone's bell, you can unplug the device.

Imagine the fix we would be in if telephones didn't have ringers. The only way to tell if someone was trying to reach us would be to pick up the handset and listen at periodic intervals. If we didn't want to chance missing any calls at all, we would have to pick up the phone very frequently indeed—and we wouldn't get much else done.

But the bell on a telephone does more than just allow you to respond to messages as you see fit without the overhead of periodically sampling the line; it virtually eliminates what we might term "mental overhead" for this device. Between rings of the telephone, you're not just ignoring it; the term ignoring implies a screening of the information coming to you through your senses. Instead, you're usually not even conscious of the existence of the telephone.

In much the same manner, interrupts are commonly used as signals from peripheral devices to let the computer's central processor know that information is waiting or that some action needs to be performed. Between interrupts, the computer can simply forget about the peripheral device; it doesn't need to poll it every so often to find out if there's anything to do.

Computers usually have a very efficient hard-wired facility, which, when triggered by the interrupt, allows suspension of the current task and rapid transfer of control to a section of program code called an *interrupt service routine*. The interrupt service routine reacts to the interrupt with appropriate input or output commands.

In addition, computers often have instructions available that allow their control programs (operating systems) to control the response to interrupts. If the program *enables* interrupts and if the proper service routines have been loaded into memory, the appropriate response to an interrupt will be automatic. If the operating system is performing a critical task, it can *mask* interrupts temporarily; when masking is in effect, the interrupt signals are received and noted, but the usual response is deferred. Finally, if the operating system just wants to ignore interrupts altogether, it can do the equivalent of unplugging the phone by *disabling* the interrupt system.

Since the typical computer has many peripheral devices competing for its attention, there is also usually some provision for prioritizing of interrupts. This allows signals from critical events or fast I/O devices to take precedence over interrupts from slower or less important ones. A good example of prioritizing is the "power-fail" interrupt that's provided on some machines, which will get control no matter what else is going on, so that register contents can be saved and the central processor can be brought to a halt in an orderly manner.

The Intel 8088's interrupt-handling capabilities are sophisticated and versatile even by the standards of much larger computers. Every external device that can produce an interrupt is assigned a type code that identifies it to the central processor; a total of 256 interrupt types are available.

Interrupts may be generated internally as well as by a peripheral. Internal interrupts might be generated by deliberate action of a program that incorporates a "software interrupt" instruction (see "Snooping in ROM: The Software Interrupt," by Peter

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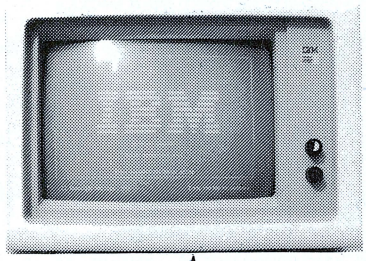

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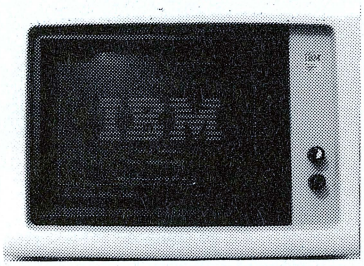

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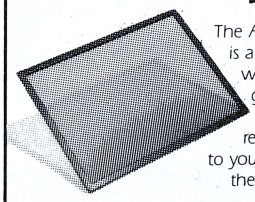

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Norton, *Softalk*, February 1983), or they might result from certain types of errors occurring during program execution. Interrupts are handled in the very same way by the computer's interrupt processing section, regardless of whether their origin is internal or external. This common handling approach greatly simplifies the coding and testing of interrupt service routines.

The 8088 is usually coupled with another Intel device called the 8259 Programmable Interrupt Controller (PIC), which contains the logic necessary to mask, unmask, and prioritize interrupt requests from the various peripheral devices. Programs can send commands to the PIC at will in order to control the responses to specific interrupt types. The 8088's internal control over interrupts is quite nonspecific; there is an interrupt flag that determines whether any interrupts will be recognized or not, and there are two instructions that turn this flag on and off.

If so many possible types of interrupts are allowed, how can the computer quickly respond with the appropriate action? Rapid transfer to the proper program for a given event is provided through a table of *interrupt vectors*. The 1,024 bytes of memory starting at location 0 are reserved for 256 four-byte addresses, each of which corresponds to one of the 256 interrupt types.

When an interrupt service routine is loaded into memory, the loader must also place the routine's starting address into the correct position in the interrupt vector table. When an interrupt is recognized, these four bytes are fetched automatically, by special hard-wired logic in the computer, and are used to force a transfer of program control to the appropriate service routine.

Now for a more technical summary of the sequence of events caused by an interrupt.

When the CPU's interrupt line is triggered, the instruction currently being executed is completed (there are a few exceptions), and then the state of the interrupt flag (IF) is examined. If IF is false (previously cleared by means of a CLI instruction), no action is taken; the interrupt is discarded. If IF is true (previously set via an STI instruction), the CPU processes the interrupt.

The current contents of the CPU flags, code segment register, and instruction pointer are pushed onto the stack. The interrupt type (a number between 0 and 255) is read in from the PIC and multiplied by 4 to form an index into the interrupt vector table. The contents of the first two bytes of the indexed slot are loaded into the instruction pointer, and the contents of the second two bytes are loaded into the code segment register; this has the same effect as a *jump* instruction and causes program execution to transfer to the interrupt service routine.

The computer automatically clears the interrupt flag when an interrupt is recognized. Thus, if an interrupt service routine wishes to allow itself to be interrupted in turn, it must explicitly turn interrupts back on with the *set interrupt* instruction (STI). If this is done, said routine might be temporarily suspended by a higher priority interrupt; otherwise the first interrupt service routine will be executed until its work is finished. The service routine must end with an *interrupt return* (IRET) instruction, which automatically pops the saved flags, code segment, and instruction pointer values off the stack back into the appropriate registers, causing resumption of the program that was originally running.

If interrupts are allowed to pile on top of each other or "nest," extreme care must be taken in the creation of the service routines. If inadequate stack space is available, the system will crash in unpredictable—and usually unreproducible—ways. A particularly subtle problem is encountered when an interrupt routine inadvertently invokes itself recursively. For example, if the processing routine for a divide overflow causes *another* divide overflow, the routine will be reentered over and over until the stack overflows and the system dies.

A few of the interrupt types have been predefined by Intel as internal or CPU-generated interrupts; these always require service routines to be present. The necessary program code is usually supplied within whichever operating system you are using (although, of course, you can take over service of any interrupt within your own programs simply by changing the address in the vector table).

Predefined interrupt type 0 is generated internally by the CPU whenever a divide instruction results in an overflow (a result too large to fit into the destination register). Interrupt type 1 is employed in a special CPU single-step execution mode and is used by debugging tools.

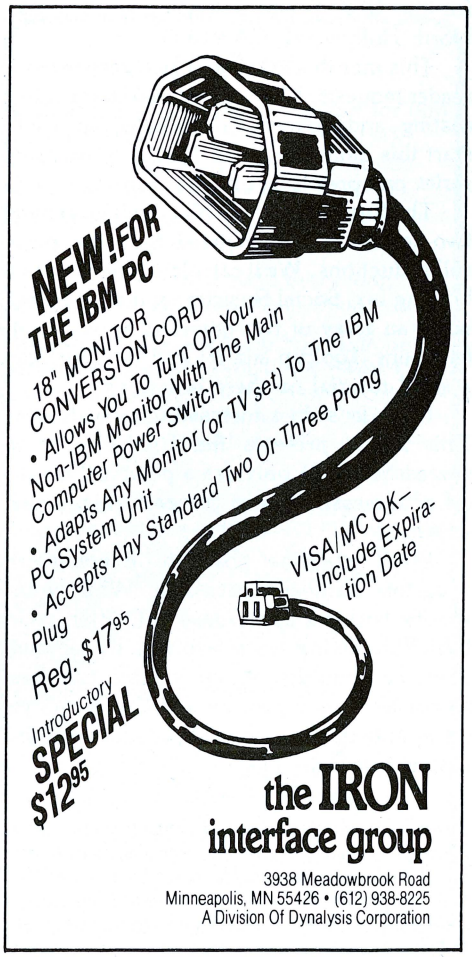
Interrupt type 2 is called NMI, for *nonmaskable interrupt*. Its signals arrive on a special line and cannot be masked or disabled. NMI is typically used for the sensing of catastrophic events, such as memory parity errors or power failure.

Interrupt type 3 is reserved for a special one-byte software interrupt instruction, which is used by debugging utilities to insert break points in other programs. Finally, interrupt type 4 is triggered only if the overflow flag (OF) is set *and* a special INTO instruction is executed. Interrupt 5 has also been reserved by Intel but has no function at present.

Aside from the CPU-generated internal interrupts, the INT instruction allows any interrupt service routine to be invoked under program control. The desired interrupt type is encoded right into the instruction and is used by the CPU to calculate the vector table address, just as in the case of an external interrupt. Besides simplifying the testing of interrupt service routines, the software INT instruction allows programs to call one another in a very safe, uniform way, without their requiring any knowledge of each other's actual memory addresses. PC-DOS and Basic use almost a hundred of the software interrupt vectors to provide linkages to their various input/output and math routines.

Proper programming of interrupt service routines for external devices requires an intimate knowledge of the hardware characteristics of the machine, of the computer's instruction set, and of the various deadlocks and conflicts that can occur when interrupts are processed asynchronously and possibly piled on top of one another. However, the software interrupt capability may be readily used to advantage by even the beginning assembly language programmer.

A future installment of this column will demonstrate how to exploit the various services in the PC-DOS operating system and the Basic ROM available through interrupt vectors. ▲



THE PROFIT PLOT

by Jack Grushcow

We're going to start this month by mapping out future topics for the Profit Plot column. This will alert you to subjects that interest you, and it will also give you an opportunity to comment on future topics. If we get enough "No! Please! Any topic but that one!" messages, we'll try another application area. Or you could say something like, "Great idea, but be sure to include information about put and call options as well." Either way, your feedback is vital.

Responses to the questionnaire in the February issue are still coming in. Let us know what application areas interest you and we'll create spreadsheets for them. Cast your vote by writing to Feedback, Softalk for the IBM Personal Computer, Box 60, North Hollywood, CA 91603.

This month's article is a first response to reader requests. Many of you asked for forecasting and payroll calculations, so we'll start this month with the first of a two-part series on spreadsheet forecasting.

The forecast articles will be followed by a two-parter on using spreadsheets for payroll deductions. We'll calculate federal withholding tax, Social Security, and state taxes, using an array of two powerful spreadsheet functions, Lookup and If; and we'll include a small tutorial on these functions.

Now, let's do a forecasting spreadsheet. This article presents the first part of a spreadsheet that provides a powerful method of forecasting your future earnings and expenses.

We'll examine how an independent drugstore handles forecasting. While your specific business applications will differ, your basic forecasting needs will not. By looking over the shoulder of our sample business forecaster, you'll gain an added perspective on how better to approach your own forecasting puzzle.

Drug World, an independently owned-and-operated drugstore in a large shopping center, sells prescription drugs plus a variety of convenience and consumer goods.

Going into her third year of operation, the owner decides to see if sales patterns are forming that can help her plan for the future. She also wants to see how her operating expenses have changed over the first two years.

By looking into the past, the owner hopes to get a better idea of what increases in sales and expenses she can expect in the coming year. Through better planning, she hopes to increase her profits in several key ways.

First, a sales forecast will help her select the best products to retail for her specific client base. Historic records should indicate which product groups are most popular.

Better buying means trimming losses caused by discounts, because goods in demand don't need to be marked down to sell. Inventory turns over faster, borrowed money is tied up for less time, and the owner increases her profit.

A second advantage to better planning is increased control over expenses. By examining historic expense patterns, the manager is better prepared to expand in good times and tighten her belt when things get rough. Expansion, hiring extra staff, and installing new equipment can be a plan instead of a panic.

The spreadsheet we'll design gives us a powerful method of forecasting both income and expenses. It's specially designed to use data you already have on hand—the forecasting spreadsheet is based on your own income statement.

	A	B	C	D	E	F
1	/FR INCOME	STATEMENTS				
2						
3		/FR YEAR	/FR"% SALES	/FR YEAR	/FR"% SALES	/FR"% CHANGE
4	SALES					
5	/--	/--	/--	/--	/--	/--
6	A	0	(B6/B14)*100	0	(D6/D14)*100	((D6−B6)/B6)*100
7	B	0	(B7/B14)*100	0	(D7/D14)*100	((D7−B7)/B7)*100
8	C	0	(B8/B14)*100	0	(D8/D14)*100	((D8−B8)/B8)*100
9	D	0	(B9/B14)*100	0	(D9/D14)*100	((D9−B9)/B9)*100
10	E	0	(B10/B14)*100	0	(D10/D14)*100	((D10−B10)/B10)*100
11	F	0	(B11/B14)*100	0	(D11/D14)*100	((D11−B11)/B11)*100
12	G	0	(B12/B14)*100	0	(D12/D14)*100	((D12−B12)/B12)*100
13	/--	/--	/--	/--	/--	/--
14	TOTAL SALES	@SUM(B5...B13)	(B14/B14)*100	@SUM(D5...D13)	(D14/D14)*100	((D14−B14)/B14)*100
15	/--	/--	/--	/--	/--	/--
16	COST OF GOODS SOLD	0	(B16/B14)*100	0	(D16/D14)*100	((D16−B16)/B16)*100
17						
18	GROSS PROFIT	+B14−B16	(B18/B14)*100	+D14−D16	(D18/D14)*100	((D18−B18)/B18)*100
19						
20	EXPENSES					
21	/--	/--	/--	/--	/--	/--
22	WAGES	0	(B22/B14)*100	0	(D22/D14)*100	((D22−B22)/B22)*100
23	RENT	0	(B23/B14)*100	0	(D23/D14)*100	((D23−B23)/B23)*100
24	UTILITIES	0	(B24/B14)*100	0	(D24/D14)*100	((D24−B24)/B24)*100
25	PROFESSIONAL SERVICES	0	(B25/B14)*100	0	(D25/D14)*100	((D25−B25)/B25)*100
26	TAXES DUE	0	(B26/B14)*100	0	(D26/D14)*100	((D26−B26)/B26)*100
27	DEPRECIATION	0	(B27/B14)*100	0	(D27/D14)*100	((D27−B27)/B27)*100
28	INTEREST	0	(B28/B14)*100	0	(D28/D14)*100	((D28−B28)/B28)*100
29	BAD DEBTS	0	(B29/B14)*100	0	(D29/D14)*100	((D29−B29)/B29)*100
30	TELEPHONE	0	(B30/B14)*100	0	(D30/D14)*100	((D30−B30)/B30)*100
31	THEFT	0	(B31/B14)*100	0	(D31/D14)*100	((D31−B31)/B31)*100
32	MISC	0	(B32/B14)*100	0	(D32/D14)*100	((D32−B32)/B32)*100
33	/--	/--	/--	/--	/--	/--
34	TOTAL EXPENSES	@SUM(B21...B33)	(B34/B14)*100	@SUM(D21...D33)	(D34/D14)*100	((D34−B34)/B34)*100
35	/--	/--	/--	/--	/--	/--
36						
37	NET PROFIT	+B18−B34	(B37/B14)*100	+D18−D34	(D37/D14)*100	((D37−B37)/B37)*100
38	/GF$					

Figure 1.

Jack Grushcow is president of Consumers Software, a company that designs and markets spreadsheet-based business packages. His latest book, The VisiCalc Applications Book, *is available from Reston Publishing. This article is based on ideas presented in that book.*

As we build this model, we'll maintain as much flexibility as possible. Entering our new projected sales figures at any time will produce a whole new income statement, with no additional work; producing an entire range of forecasts based on our best, worst, and optimum sales estimates will be simple.

This application allows the small business to plan the way the big business does. Usually, the small guy first takes a punch in the nose, then reacts. By planning, you can act instead of react, which is one way small businesses get big, regardless of the size of annual sales.

We'll build this spreadsheet in two sections, one displaying previous income statements, allowing us to spot past trends, and the other helping us to intelligently forecast the future based on past performance. This forecasting model can be used profitably by any business that produces an income statement and whose owner needs to understand trends better.

As you watch the Drug World forecaster wrestle with various assumptions, keep in mind how you'd approach these problems. There's more to using this sheet successfully than just plugging in numbers. We'll examine the thoughts behind the numbers that go into the spreadsheet to help you better appreciate the intricacies in forecasting your own income statement.

Figure 1 shows the keystrokes required for the first six columns of our spreadsheet. This historic section will hold the results of previous operating years.

To keep this model general, we've started with letters in locations A6 through A12, which will be replaced by areas that generate your sales. You may have more or fewer profit centers than Drug World. As we customize this spreadsheet, deleting and inserting rows as necessary, imagine how you would adjust it to hold your own financial data.

Figure 2 shows the annual income statements that form the historic backbone of the forecast. We'll begin our analysis of Drug World by entering the two annual income statements into the forecast spreadsheet. In column A we'll list the row names for the six Drug World departments in which sales occurred: prescription drugs, over-the-counter remedies, cosmetics, spirits, tobacco, and books and magazines. Each department is responsible for a portion of the profit picture.

A manufacturer will have different product lines; a lawyer will perform different client tasks, and a printer will use different production centers. Your profit centers can be divided into individual categories, too.

Remember, to break down the cryptic, all-encompassing description of "Sales" into categories that indicate where sales are generated requires organized record-keeping. Somewhere in its accounting process, Drug World must record sales for its various products, allowing its management to make intelligent decisions regarding the six different sales centers.

DRUG WORLD

INCOME STATEMENTS 1981-82

	1981	1982
SALES:		
PRESCRIPTION	528000.00	586080.00
OTC REMEDIES	228000.00	264480.00
COSMETICS	204000.00	222360.00
SPIRITS	108000.00	105840.00
TOBACCO	96000.00	96960.00
BOOKS/MAGS	36000.00	37080.00
TOTAL SALES	1200000.00	1312800.00
COST OF GOODS SOLD	726000.00	781116.00
GROSS PROFIT	474000.00	531684.00
EXPENSES:		
WAGES	252000.00	288816.00
RENT	37200.00	37200.00
UTILITIES	6550.00	7200.00
PROFESSIONAL SERVICES	3600.00	3485.00
TAXES DUE	24000.00	26200.00
DEPRECIATION	12000.00	13080.00
INTEREST	48000.00	54080.00
BAD DEBTS	7200.00	6455.00
TELEPHONE	6000.00	6225.00
THEFT	3600.00	2625.60
TOTAL EXPENSES	400150.00	445366.60
NET PROFIT	73850.00	86317.40

Figure 2.

We begin entering data into this spreadsheet by overwriting the label "Year" in columns B and D. Move your cursor to B3 and enter "1981, then to D3 and enter "1982.

Now, position your cursor at A6 and enter these labels down column A of our sample spreadsheet: Prescription, OTC Remedies, Cosmetics, Spirits, Tobacco, Books/Mags. (*SuperCalc* users must include leading quotes in front of each string.)

With labels in locations A6 through A11, move your cursor to A12. We don't need this row, since there are only six sales areas. Any row not used in this spreadsheet must be removed. Empty rows will display "Error" at various formulas, caused by zero divides; if they're not removed, the error messages will be carried forward through subsequent calculations, overwriting useful information.

Delete this unwanted row by moving to row 12 and using your /DR command (which *SuperCalc* users will follow with the enter key).

Now record the sales data from 1981 by moving your cursor to B6 and entering these figures:

Cell	Amount
B6	528000
B7	228000
B8	204000
B9	108000
B10	96000
B11	36000

Move your cursor to D6 and enter these figures for 1982:

Cell	Amount
D6	586080
D7	264480
D8	222360
D9	105840
D10	96960
D11	37080

Total sales for 1981 are shown at B13 as 1200000, and at D13 for 1982 as 1312800. Check them to ensure that you typed in the correct figures.

The spreadsheet automatically calculates and displays the percentage of total sales represented by each product group. Column F shows the percent change of each group between 1981 and 1982.

First, let's examine sales as a percent of total sales by product group by moving the cursor to C6 and examining the formula. To calculate the percent of total sales, we need to divide the prescription sales by the total sales and multiply this by 100. The formula (B6/B13)*100 does this calculation. In 1981, prescription sales represented 44 percent of total sales; in 1982, they represented 44.64 percent.

To complete the spreadsheet's income section, we must enter the cost of goods sold to determine gross profit for each year.

According to Drug World's income statements, the 1981 cost of goods sold was $726,000; in 1982, it was $781,116. Move

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SALES	1981	% SALES	1982	% SALES	% CHANGE
PRESCRIPTION	528000.00	44.00	586080.00	44.64	11.00
OTC REMEDIES	228000.00	19.00	264480.00	20.15	16.00
COSMETICS	204000.00	17.00	222360.00	16.94	9.00
SPIRITS	108000.00	9.00	105840.00	8.06	−2.00
TOBACCO	96000.00	8.00	96960.00	7.39	1.00
BOOKS/MAGS	36000.00	3.00	37080.00	2.82	3.00
TOTAL SALES	1200000.00	100.00	1312800.00	100.00	9.40
COST OF GOODS SOLD	726000.00	60.50	781116.00	59.50	7.59
GROSS PROFIT	474000.00	39.50	531684.00	40.50	12.17
EXPENSES					
WAGES	252000.00	21.00	288816.00	22.00	14.61
RENT	37200.00	3.10	37200.00	2.83	0.00
UTILITIES	6550.00	0.55	7200.00	0.55	9.92
PROFESSIONAL SERVICES	3600.00	0.30	3485.00	0.27	−3.19
TAXES DUE	24000.00	2.00	26200.00	2.00	9.17
DEPRECIATION	12000.00	1.00	13080.00	1.00	9.00
INTEREST	48000.00	4.00	54080.00	4.12	12.67
BAD DEBTS	7200.00	0.60	6455.00	0.49	−10.35
TELEPHONE	6000.00	0.50	6225.00	0.47	3.75
THEFT	3600.00	0.30	2625.60	0.20	−27.07
TOTAL EXPENSES	400150.00	33.35	445366.60	33.92	11.30
NET PROFIT	73850.00	6.15	86317.40	6.58	16.88

Figure 3.

your cursor to B15 and enter 726000, then to D15 and enter 781116.

Gross profit for the two years is displayed in columns B and D of row 17. The percentage change for each sales category is shown in column F. This tells us which of our sales areas and expenses increased between 1981 and 1982, and at what rate. The percentage change is calculated by subtracting the sales in 1981 from the sales in 1982, dividing the result by the 1981 sales, and multiplying by 100.

Move your cursor to F6; you should see 11 percent displayed, indicating that prescription sales have increased that amount from 1981 to 1982. By looking down this "% Change" column, we see that prescription drugs are second only to over-the-counter remedies in growth.

Contrast the information in the "% Change" column with that in the "% Sales" column and you can easily see what sales have increased and by how much. For example, reading across row 6 we see that prescription drugs increased their share of total sales by .64 percent (44.64 percent minus 44 percent). We see how each product changes relative to total sales, as well as how its own sales increased from one year to the next.

What portrait of sales does this spreadsheet paint for us? Over-the-counter remedies—cold capsules, vitamins, and so forth—show the greatest growth, increasing by 16 percent, followed by the 11 percent increase in prescription sales. Management credits this growth to special advertising campaigns begun in 1981, as well as aggressive sales and use of loss leaders.

The next best growth area is cosmetics, followed by books and magazines. Tobacco is essentially unchanged and, interestingly, spirits—wine, beer, and liquor—show a sales decrease of 2 percent. We'll come back to these numbers later, because they're the basis for projecting Drug World's 1983 sales.

Total sales increased by almost 10 percent for this period. The slow growth in the cost of goods sold, relative to sales, increased the gross margin. This could have been caused by price breaks due to larger volume purchases. The result is that the gross profit has increased by 1 percent (40.5 minus 39.5) between the two years. This may not seem like much, but on Drug World's sales of $1.3 million it represents an increased profit of $13,000.

Let's see how the overhead expenses of running the drugstore changed during the first two years.

Refer again to the sample income statement to enter the expense data for 1981 and 1982 in the spreadsheet's expense portion. Move your cursor to B21 and enter these figures for 1981:

Cell	Amount
B21	252000
B22	37200
B23	6550
B24	3660
B25	24000
B26	12000
B27	48000
B28	7200
B29	6000
B30	3600

Now move your cursor to D21 and enter these figures for 1982:

Cell	Amount
D21	288816
D22	37200
D23	7200
D24	3485
D25	26200
D26	13080
D27	54080
D28	6455
D29	6225
D30	2625.60

We have no information to enter in the "Misc" row, so we need to delete it. Move your cursor into row 31 and use the /DR command.

Your spreadsheet should now look like figure 3.

Let's analyze Drug World's expenses the way we did its income. The greatest single expense for this company is labor. Unfortunately, there was a 14.6 percent increase, the largest of any expense category. This was due to general wage increases in the economic sector, as well as to rapid staff turnover, which necessitated substantially more overtime in 1982 than in 1981. As a result, the cost of wages grew from 21 percent of sales to 22 percent. The problem of turnover will have to be addressed in the future.

All other expenses remained relatively in line with general price inflation; the exception is a significant reduction in theft and bad debts. Security mirrors were installed and a much more rigid check-cashing policy was implemented. Both policies appear to have paid dividends.

All in all, expenses as a percent of sales stayed almost the same, 33.35 percent in 1981 versus 33.92 percent in 1982. As noted, most of the rise in cost is due to increased wages. Net profit as a percent of sales remained fairly stable; 6.15 percent in 1981 versus 6.58 percent in 1982.

This completes our look at Drug World's first two years of operation. We now have a quantitative understanding of past performance. From this improved perspective will come the basis of a better forecast for future performance.

Next month we'll build the second part of the model, the forecast section. With it, we'll examine our guesses about the future to see if our sales estimates and assumptions about future wages will stand the light of day.

Until then, keep your comments coming in. ▲

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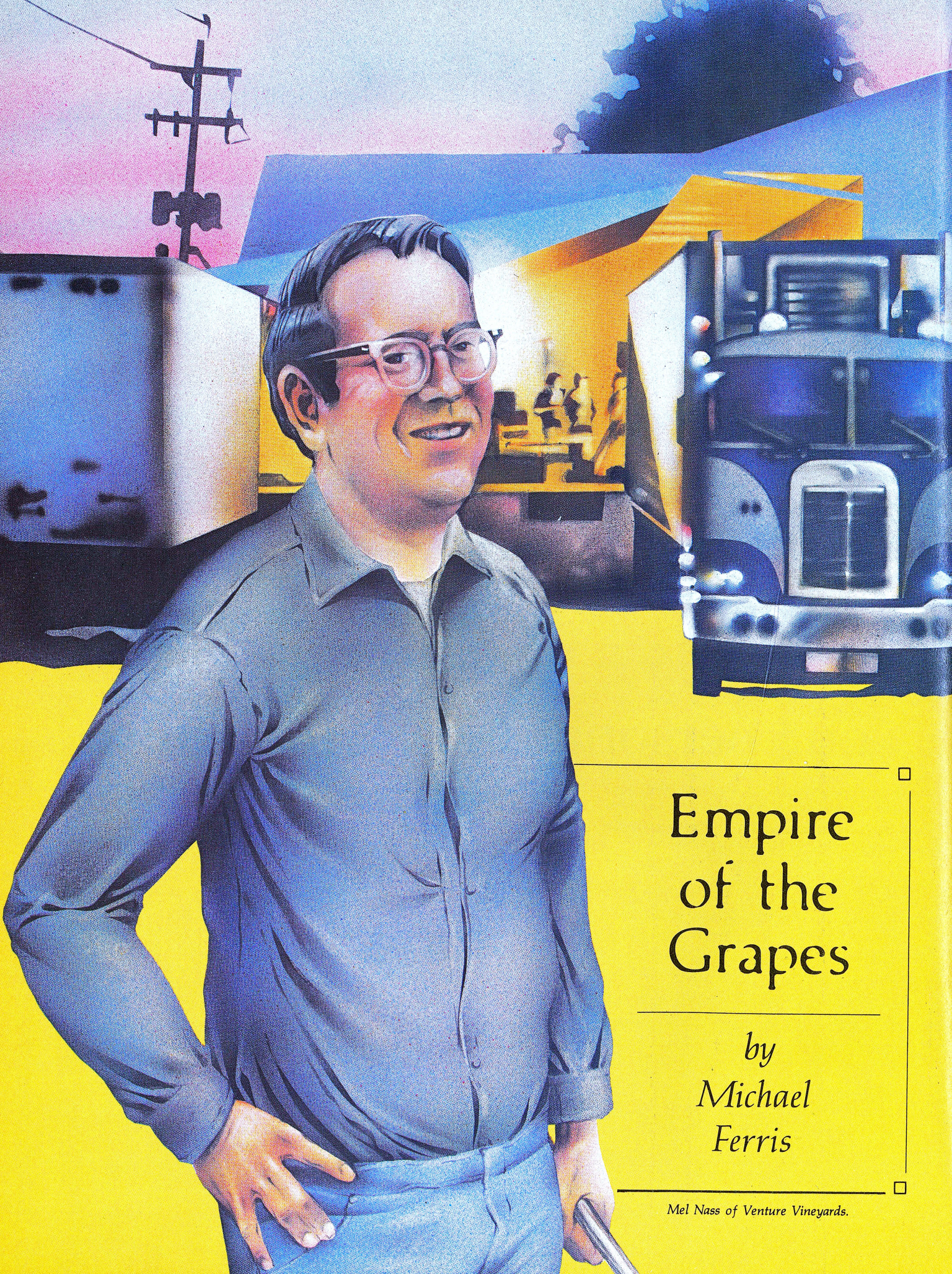

Empire of the Grapes

by Michael Ferris

Mel Nass of Venture Vineyards.

A Concord Saga

How are you supposed to eat a grape?

Not a pale green Thompson Seedless—those are easy—but an exotic, plump, slip-skin Concord. Royal-toned and frosty, yet deep-down sweet.

How does one devour the king of the Lambrusco species, complete with seeds?

With g-r-e-a-t respect—three fingers, please! Or with bacchanalian abandon, tossing your head back and laughing, plucking at the bunch with your teeth. It all depends on your level of sophistication, or your sense of history. "People eat them in many ways," says Mel Nass of Venture Vineyards. "That's what makes it fun."

You can (a) squirt the innards out and just eat that, stacking the seeds and leaving a trail of skins as you dine; (b) have them peeled by somebody named Beulah, as Mae West did in the movies; (c) eat both the tender skin and the pulp, spitting the seeds through a space between your teeth; (d) eat the whole fruit, popping it in your mouth with a crunch, seeds and all.

"Or you can just say, 'I'm not gonna mess with these things,' and leave it at that," shrugs Nass.

Fortunately for Nass, the largest shipper of Concord grapes in America, that's not the popular choice. Nass himself gets all the credit. That's why *American Fruit Grower* magazine has dubbed him "King of the Concords."

Concord Comeback. Thanks to Nass's marketing savvy and some Basic programming on the pc, the once-reigning Concord is now making a fresh comeback in the supermarkets of America.

Before Prohibition and the invention of the Thompson Seedless, the Concord was both a wine grape and the number one table grape. At the turn of the century, trainloads of them were shipped across the country from upstate New York's grape-growing wonderland, the Finger Lakes region.

Today, from the same rich farmland near Ithaca, Venture Vineyards has launched the revival of the species. The Concord is once again shipped across the country—this time in refrigerated trucks—as an exotic, upscale choice of fresh fruit.

Grape Potential. It's a sales strategy that is paying off for Mel and Phyllis Nass, husband-and-wife partners in Venture Vineyards. She runs the farm, and he, with the help of the pc, heads the Concord grape revolution. It's a team effort that earned Nass a speaking engagement last February at a convention at the Disneyland Hotel in Anaheim, California.

Under a banner proclaiming "It's a fresh world after all," the United Fresh Fruit and Vegetable Association's gathering had a carnivallike atmosphere. Between business dealings, the Nasses could have their pictures taken with Chiquita Banana, Mickey Mouse, or a huge potato in a cowboy hat. They could spin a wheel or reach into a plastic box whirling with Ping-Pong balls to win a prize. All the while getting their badges slapped with bright fruit stickers, and snacking on onion rings, french fries, carrot chips, fried yams, Belgian endive, peanuts, and avocados.

Not to mention plain old apples, bananas, oranges, strawberries, grapefruit, lemons, limes, and grapes.

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At the end of the three-day show, says Nass, the produce exhibitors gave their displays away. Hundreds of pounds of exotic edibles, from kiwi fruit to walnuts, were scooped up by the crateful—something you won't see at your next computer fair.

Nass's speech was part of a presentation on computers in small business, a subject he knows firsthand, inside and out, from both angles, and probably even upside down. Prior to venturing into the vineyards, Nass was one of the big boys at IBM.

Converging Lines of Design. Nass entered the Big Blue universe at the start of that company's mainframe heyday. The scientifically oriented 700 series and the 704, 705, and 7090 commercial series were two lines of computer design that converged into the popular 360 system. The 360, 1400, 1460, and Ramack systems were all part of the IBM explosion in the sixties—an exciting time for Nass, who did some of the programming on the commercial side of the house.

One aspect of those early years that Nass particularly misses is being able to see a program from beginning to end. "Nowadays," he says, "things are more modulized in the larger development houses. You get some part of a job, are passed some parameters, and write the code required. When you're done, you're passing parameters on to somebody else.

"Take Apple Computer's Lisa, for example. It's got over two million statements; you know one person didn't write that.

"Doing it this way creates standards, better testing techniques, makes logic more understandable, and is more efficient in the long run, but it takes a lot of the fly-by-your-pants out of programming and a lot of the individualism out of the whole operation."

On the other hand, all this added structure is a good thing too, says Nass. "There are a lot of nonprofessional seat-of-the-pants guys doing some wonderful things, but large pieces of their work may never be carried on by another programmer who could do a little bit more. By trying to save themselves the anxiety and grief of rewriting and modification, they miss what a modulized system of development would give them."

An entrepreneur at heart, Nass still enjoyed programming more "back when you could start at point A and complete the total code at point Z. There's nothing wrong with modulization, but I like to see the whole egg," he says.

After fourteen years of team playing at IBM in New York, Nass, an ambitious dreamer, hit his personal corporate ceiling. "I realized I would never be chairman of the board," he says, tongue-in-cheek. "You can see I'm not too sharp; it took me fourteen years."

Looking Again at the Big Blue. After mostly being rated an outstanding performer all those years, Nass found his initial job enthusiasm waning. A subliminal desire to succeed was losing out to cold, hard reality. Eventually, he started to rethink his commitment to the Big Blue.

"But IBM was such a great company. The promotions were always there, the salary was always right and improving, and the opportunities and work were exciting."

Still, they weren't holding a chair for him in the corporate den. "If I was going to come up a couple more rungs and grow at the company, at least I would do it for myself," he decided. At the same time, another, deeper desire was surfacing within him, one that held more sway than his corporate longings.

He was feeling ready to hang up his three-piece suit. "My grandmother had a little garden, and I used to work with her in it. I always had the desire to get into agriculture." This primitive desire to work with the soil was eroding his urban, white-collar persona.

"The kind of guy I am, with the personality I have, I'm gonna want to strike out on my own," he says. The three Nass children were all in school; Phyllis, a grade-school teacher, was thinking of going back to school; the timing was right. "I said to myself, 'Hey, am I happy working here for the rest of my life or is there something I really want to try?' "

Between booths and buyers, Phyllis Nass does some conventioneering by the pool at the Disneyland Hotel.

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Soilent Green. Running his own farm was what he wanted to try. Nass could become the chairman of his own board, set his own hours, and offer his children some background in a business. As it was, he says, "I couldn't take them to work with me at IBM."

As a self-employed couple, the Nasses could work at home, a prospect both found more interesting than nine-to-five. "At the time, I was working a twelve-hour, action-packed day at IBM, and weekends as well."

There was a lot to the idea of breaking out of the corporate rat race and digging the earth. But that's all it was—an idea. The Nasses knew nothing about farming. So, by taking the most logical approach they could to the wildest dream they had, they literally went knocking on farmland's front door.

"What we would do, on weekends, was get dressed up in jeans and knock on a farmer's door, introduce ourselves, and say, 'What we'd like to do is work for you this weekend for free.' "

"Some would laugh and say, 'Are you serious?' " says Phyllis, but they got their foot in many a door.

"We'd clean the barn if it was a dairy, the chicken coops if there was poultry. Then we'd sit down and ask the farmer what he thought the future was in this particular business. 'How did you get started? Are you happy? You've seen us work, would you recommend us taking this on as a full-time business?' "

After three months of working on over twenty types of farms—from corn, oats, and potatoes to poultry and dairy—they came across the beauty of grapes and tree fruits.

"At this point," says Phyllis Nass, "whether we should plant something that grows or raise an animal was a very basic decision. Grapes and tree fruits were very appealing."

They decided to go with the grapes. It was economics that chose the Finger Lakes region. "We were using our own dollars, and an acre of land in the region cost about three hundred dollars. The land value of a similar acre in the grape-growing region of California was about six thousand dollars," explains Nass. "On Long Island, it was about three thousand."

Then, the couple went to the experts for advice as to which pieces of land in the Finger Lakes would be most successful. Professors at Cornell and the Geneva Experiment Station were among those who outlined the lake and soil conditions and weather history of the area for the Nasses.

At the same time, the couple collected facts on what it took to run a farm with a vineyard. "Like what a barn would cost, what equipment you needed, fertilizer rates, spraying rates, what a trellis looked like, what you could do with grapes, and so on," says Nass.

"Then we'd go up to a farm that seemed right and say, 'We're looking for a farm with a house just like you have. Do you know anybody in the area with a farm like yours?' "

The agricultural community, according to Phyllis, is very tightly knit. "Good farms are usually snapped up by neighbors. It's very difficult for an outsider to break in; the insiders know the whole scoop on the land."

Buying the Farm. Eventually, they found the Halsey Fruit Farm. It was the farm of their dreams and qualified under the conditions of their scientific research. Besides the three types of Lambruscos—Concord, Niagara, and Catawba—the farm included twenty acres of peaches, cherries, and pears.

They took a ninety-day option to buy the Halsey farm. "I told IBM I was going to buy a farm. I said I could keep on working or take my break and do my thing.

"Their position was that growing grapes would not be the soundest thing; however, you've been a good employee and we'll make it happen. Maybe it won't work out. Meanwhile, you can serve actively and well in the Syracuse area. If it doesn't work, there's always the fast track again.'

So the two city slickers moved to their dream farm in the wilds of Lodi, and for Phyllis Nass any resemblance to the television comedy *Green Acres* ends here. Unlike the series' glamorous Eva Gabor, all frills and domesticity, Phyllis Nass rolled up her sleeves and got dirty.

"All day was spent in the field—just me," she says. "It was very hard doing the spraying, disking, and mowing, the contract stuff, and speaking to people about buying materials. I had to learn how to spray. I met with growers with similar problems. I read books on what I didn't know, went to horticulture shows. I'd take a tool out into the field to better understand its practical values, and all that."

Meanwhile, Mel Nass was working his nine-to-five with the gang in Syracuse. "I'd get up and put the implement on the tractor. Then I'd leave Phyllis a list. She'd spend the day driving the equipment and executing the list of things to be done. I'd come home and reset everything. Then we'd replan our program—Phyllis would have made a new list—and then we'd go to sleep."

"For six years we did this, building Venture Vineyards while I did data processing," says Nass. This dual dedication began to pay off for the farm team, and success was snowballing. "The farm was growing in leaps and bounds. I finally said, 'Hey, we just can't go on like this any more.' That's how the break came."

They went into agriculture full-time. "In retrospect, I could have left IBM a few years earlier, but I'm a very conservative guy and took it as far down the line as I could. I didn't want to burn any bridges."

Thriving Enterprise. Venture Vineyards is a thriving enterprise today, employing about one hundred fifty people, most of them taken on during harvest time, from August to October each year. Additional acreage was purchased, a new house built, loading docks expanded, and Nass designed and built a refrigerated, grape cold-storage facility.

The Nasses are farmers now, and Phyllis is as busy as ever. In

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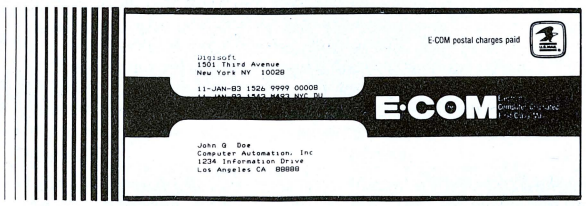

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addition to making the decisions on the grape-growing operations, she oversees a hay-wagon tour, where visitors can see what goes on at the farm, and a pick-your-own-peaches-cherries-and-pears operation. She has even done some substitute teaching, to help her get to know the community.

Her role as head of major farm operations still stuns a few locals. "A fertilizer salesman called for Mel about some equipment a while back, and I answered the phone. I told him Mel was busy, but if he wanted to speak to the boss of the farm, he was talking to her." There was a silence on the other end of the line.

After ten years of equally shared agricultural experience, the Nasses can fill in for each other on just about any job. Their system of responsibility is based on who is most knowledgeable on the subject. "In certain things, I would be," says Nass, "because I have the numbers on the top of my head. In other areas, Phyllis has faster recall."

The one thing Phyllis leaves to Mel is programming. However, she can go into the code and make changes if necessary, or do the sorts and merges. "Mel makes me read all the books," she says. "If we had both taken courses together, it would be different. As it stands now, Mel does a heck of a better job." Besides, she has a farm to run.

The two Nass boys, Andrew and Gregg, also have put in their time driving tractors and trucks, cooking, and running the farm. They held down the fort while mom and dad went convention-eering.

Daughter Robin decided on Yale instead of nearby Cornell, so she wouldn't be tempted to run home and make meals, count boxes, run the tractor, or recruit friends to pick grapes come harvest time. Robin had worked at IBM part-time demonstrating the pc, and helped her dad learn *VisiCalc.*

Rejuvenated Old-Timer. In the competitive produce world, Nass has taken an old-timer like the Concord table grape, spruced up its image, and made it feel wanted again.

One way he makes it profitable to ship such a perishable exotic is by moving them out only in full truckloads. "It's important that a salesman knows all the customers on a given route. One sale might be only 25 percent of a truckload," says Nass. The rest of that load must be sold before the truck rolls.

It's a far cry from the days when Nass used to deliver boxes of grapes from the back of a Volvo station wagon on his way to work. That's why three salesmen and three pcs make up the current Venture Vineyards sales staff. They use a sales program, custom-written by Nass, that effectively combines customer, truck routing, and call-back information into a sharp new selling tool.

Each salesman has his own set of disks for his particular region of sales: Northeast, South, or West. When they come into work each morning, a printout of the calls each salesman must make is draped across his keyboard. "All he has to do is throw the switch and away he goes," says Nass, who designed the program's operation in a simple Q&A format.

The first thing a salesman calls up is the list of routes in his area. For example, in the Northeast, the first route is from Lodi to Syracuse to Utica to Albany, New York. Next, he asks for a list of the customers along that section of highway. A supermarket's name, phone, number of stores, the name of the person to ship to, and warehouse information come up.

At this point, he can check a store's buying history over the past three years, catalogued by order date. Or he can check a comments

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file to update himself on a particular client. After making a sales call and securing an order, all the facts are entered and an invoice is printed. If a sale was not clinched, the customer's name goes into a tickler file to become the next day's priority.

"Since the growing season is so short, all their work is concentrated into an eight to ten-week time frame," says Nass. That's why follow-up calls every two or three days is so important.

There are more than two hundred fifty customers in each sales region. "With the pc acting as both secretary and memory," says Nass, "the salesmen can make more intelligent calls. They're also more personal."

All day long the salesmen's updates of comments, sales, and callbacks are dumped into bucket files that are sorted and merged at the end of each day. Calls are logged in military time for easier sorting. Once a week, third backup copies of each disk are put in a bank for safekeeping. Although, says Nass, "nothing has crashed yet. There hasn't been a single bug."

Special Database. Nass has also created a special database to log information on the more than eighty growers who deliver grapes to Venture Vineyards for shipping. Included are contract data, grade and variety of grape, price per ton, information on what was delivered last season, and comments. The files are updated daily during the season.

Mailing-label routines are included in both programs. The eighty growers are sent seasonal newsletters, and grape customers are sent point-of-purchase promotion packages.

It isn't surprising, with twenty years of experience at IBM, that Nass rolled his own programs. "Right off the bat, I knew there were no commercial packages with routing in them," he says. He knew what he wanted and designed it, just as he did his special cardboard grape containers, his refrigerated cooling room, and his new farm career.

What is surprising, considering his formidable background in Cobol, Fortran, assembly, APL, and PL/1, is that he wrote his program in plain old Basic. "I did it in Basic because it's what was there," he says. "It's even easier than what we had way back then," before the high-level languages were created.

Nass began the project by drawing the necessary flow charts, Scotch-taping yellow legal paper together. The truck routes were drawn up first, from information taken from a Rand McNally road map. Then, working from a Basic manual, he compiled and debugged the code. It was all done as piecework over a three-month period. "If I was to sit right down and do it again, I imagine it would take about five to six weeks," he says.

The decision to go with a pc-based system came about when Nass considered employing an IBM System 34 mini, but twenty to thirty thousand dollars made it a major investment. "For about four thousand dollars, you're in business with the pc, and at a minimal financial risk," he says.

Venture Vineyards is rapidly outgrowing its mom-and-pop image. Soon, the two-month shipping season will be extended to three months as the Nasses open a branch of operations in Arkansas, where the grapes ripen several weeks sooner.

Now that the three Nass kids know the business and grape sales are booming, the hardworking Nasses can enjoy working on new dreams and ambitions. And they do. "I get all the crazy ideas and Phyllis discards 90 percent of them," says Nass.

"But it's that 10 percent that really works," says Phyllis, with a grin.

They joke about shucking it all and starting over. "Phyllis and I both feel that we could put on a knapsack and leave the whole thing. Just walk down the street and be successful in something, whatever it was. Like brain surgery," kids Nass.

Why not? It sounds no crazier than growing grapes. ▲

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THE BASIC SOLUTION

BY JOE JUHASZ

In last month's column, we started building a general-purpose Basic input module by creating the routine *Ckkey*. Ckkey, you'll recall, allows you to specify legal keystrokes, specify and test for function keys and other special keys, and control capitalization of input; it also signals illegal keys with a tone.

The Ckkey routine accepts only one key at a time. The next step is to create a routine to accept complete fields of input. We'll do this by creating a "driver" routine, called *Ckfield*, that will use Ckkey.

Ckfield will allow the user to limit the length of data entered into a field (one to seventy-nine characters); specify the row and column where the field will be displayed; use the tab and shift-tab keys to act as enter keys; use the cursor keys within the field; and use the insert, delete, and other editing keys. The key marked *end* will be used to move the cursor to the last nonblank character in the field; control-end will erase all characters above and to the right of the cursor, and control-left-arrow will move the cursor to the start of the field.

Variables used in Ckfield are as follows: F.field$ is a working variable containing the data in the field (do not use this variable within your calling program); Ckfield$ contains the field data on exit from the routine; F.fl specifies the maximum field length; F.row holds the row location of the field; F.col holds the column location of the field; Ckmax specifies the length of the field plus one (to allow for the enter key).

Cn holds the position of the cursor within the field.

Khit holds the number of keys pressed during entry of the field. The escape key (if allowed) sets Khit to 2. If Khit equals 1 on return from Ckfield, then the field was unchanged.

Ins, if true, means we are in insert mode.

Special$ defines the special editing keys in ASCII.

Rtab$ allows use of the tab key as an enter key.

For Ckfield to accept data from a user, it must know the following: the screen location where it's to display the input (F.row, F.col); the number of characters allowed (F.fl); the allowable character set (Minkey, Maxkey, Caller); and the capitalization status (Capson).

Ckfield receives this information by means of certain variables. Once Ckfield is called, it proceeds to call Ckkey continually, to retrieve one allowable keystroke at a time. It continues to call Ckkey until the enter key is pressed or until any allowable "special" key (tab, escape, or the function, control, or alternate keys) is pressed.

On leaving Ckfield, the data entered is stored in the variable Ckfield$. On return from Ckfield, the variables Ck$, Fkey, and Tcki may be tested to determine which key caused return from Ckfield. For example, if on return from Ckfield the variable Tcki equals 72, then the up cursor was the last keystroke pressed. For details see last month's column and the Basic manual, appendix G-7.

Lines 1100 through 1220 show a sample use of Ckfield. Lines 4030 through 4160 initialize certain variables used by Ckkey and Ckfield.

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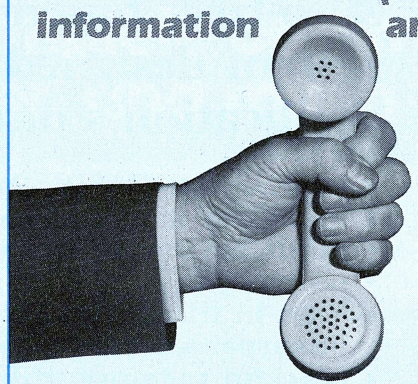

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```
1000  '*************************************
1010  '*** SAMPLE CALLING SEQUENCE  ***
1020  '*************************************
1030  GOSUB 4030                                  '-initialize variables
1040  '** ----------------------------------------**
1050  '**-- The following accepts a 10-character name at --**
1060  '**-- row 20, col 60 and displays at row 22, col 1. --**
1070  '**-- The only allowable keys are A-Z and space.  --**
1080  '**-- Function Key #1 ends the routine.          --**
1090  '** ----------------------------------------**
1100  LOCATE 20,55: PRINT "NAME";SPACE$(11);      '-show prompt
1110  F.ROW=20: F.COL=60                          '-set row, column of field
1120  F.FL=10                                     '-set max length of field
1130  MINKEY=ASC("A"): MAXKEY=ASC("Z")            '-set min and max range
1140  CAPSON=TRUE                                 '-set capitals on
1150  CALLER=1                                    '-allow spaces
1160  FKEYS=1: FKEY.A(1)=1                        '-allow < F1 >
1170  GOSUB 6000                                  '-call CKFIELD
1180  IF FKEY=1 GOTO 1210                         '-test for < F1 >
1190  LOCATE 22,1: PRINT CKFIELD$;                '-show field
1200  GOTO 1100                                   '-get another
1210  LOCATE 23,1: PRINT "Function Key #1 Pressed—END";
1220  END
1230  '
4000          ' ************************
4010          ' *** INITIALIZATION  ***
4020          ' ************************
4030  KEY OFF: FOR I=1 TO 10: KEY I,"": NEXT      '-turn off function keys
4040  TRUE=-1: FALSE=0                            '-set up TRUE, FALSE switches
4050  DISPLAY=1                                   '-<1>MONO or < 2>GRAPHICS adptr
4060  ENTER$=CHR$(13): BKSPC$=CHR$(8): ESC$=CHR$(27)
4070  DIM FKEY.A(15), LKEYS$(10)                  '-dimension arrays
4080  F.FIELD$=SPACE$(79)                         '-set f.field$ max of 79 chars
4090  RTAB$=CHR$(9): LTAB=15: UPTAB=72: DNTAB=80: RARW=77: LARW=75
4100  I$=CHR$(0): SPECIAL$=I$+"K"+I$+"M"+I$+"S"+I$+"R"+I$+"O"+I$+"s"+I$+"u"
4110                        ' 00+75 /00+77 /00+83 /00+82 /00+79 /00+115 /00+117
4120  '***Set up allowable sets of keys
4130  LKEYS$(1)=" "                  '-CALLER=1 to allow a space
4140  LKEYS$(2)=" 1234567890"        '-CALLER=2 to allow numbers and space
4150  LKEYS$(3)=" 1234567890.-+"     '-CALLER=3 for digits, " ",period, + - signs
4160  RETURN
4170  '
5000          ' ****************
5010          ' *** CK KEY ***
5020          ' ****************
5030  '*** ckkey ***
5040  IF INKEY$><"" GOTO 5040                     '-clear keystroke buffer
5050  FKEY=0: TCKI=0                              '-reset variables
5060  CK$=INKEY$: IF CK$="" GOTO 5060             '-wait, place keystroke in CK$
5070  '** If CAPSON then convert to upper case
5080  IF CAPSON AND CK$>="a"AND CK$<="z" THEN CK$=CHR$(ASC(CK$) AND &HDF)
5090  '** For special keys (such as function keys) INKEY$ returns 00 + xx
5100  '** To process these special keys goto line 5160
5110  CK=ASC(CK$): IF CK=0 GOTO 5200              '-check for special keys
5120  '** Check key and see if it was within allowable range
5130  IF CK>=MINKEY AND CK <=MAXKEY GOTO 5310   '-good keys
5140  '** Following statement is used in field processing
5150  IF CKFIELD.SW AND (CK$=ENTER$ OR CK$=BKSPC$) GOTO 5310
5160  '** Check key and see if it is part of allowable set of keys
5170  IF INSTR(LKEYS$(CALLER),CK$)=0 GOTO 5300 ELSE GOTO 5310
5180                                  '=0 error      NOT=0 okay
5190  '** Process special keys (00 + xx)
5200  TCKI=ASC(RIGHT$(CK$,1))                     '-get second byte of special key
5210  '** Special test to determine if function key (1-10)
5220  IF TCKI>58 AND TCKI<69 THEN TCKI=TCKI-58: FKEY=TCKI
5230  '** Following statement is used in field processing
5240  IF CKFIELD.SW AND INSTR(SPECIAL$,CK$)>0 GOTO 5310
5250  '** Test array of allowable special keys
5260  FOR TI=1 TO FKEYS
5270  IF TCKI=FKEY.A(TI) GOTO 5310
5280  NEXT
5290  '** If you reach here, it was an illegal key
5300  SOUND 50,4: GOTO 5040                       '-tone to signal a bad key
5310  RETURN
5320  '
6000                  ' *****************
6010                  ' *** CKFIELD  ***
6020                  ' *****************
6030  '
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```
6040  IF INKEY$ >< "" GOTO 6040                    '-clear keystroke buffer
6050  CKFIELD.SW=TRUE: INS=FALSE                   '-initialize switches
6060  CKMAX=F.FL+1:  KHIT=0:  CN=1                 '  and variables
6070  LOCATE F.ROW,F.COL,1              '-place cursor at start of field
6080  '**---keystroke processing loop---**
6090  LOCATE F.ROW,F.COL+CN-1,1     '-place cursor at current position
6100  GOSUB 5050                                   '-call CKKEY at 5050
6110  KHIT=KHIT+1                                  '-increment KHIT
6120  IF TCKI>0 GOTO 6300                          '-test for 'special' key
6130  IF CK>31 AND CN<CKMAX GOTO 6190              '-test for 'normal' key
6140  IF CK$=ENTER$ OR CK$=RTAB$ GOTO 6400         '-Enter key?
6150  IF CK$=BKSPC$ GOTO 6470                      '-Bkspc key?
6160  IF CK$=ESC$ THEN KHIT=2: GOTO 6420           '-Escape key?
6170  BEEP: KHIT=KHIT-1:  GOTO 6100   '-unknown key; should never get here
6180  '**--normal keys--**
6190  IF INS GOTO 6220                             '-if inserting then go
6200  PRINT CK$;: CN=CN+1: GOTO 6100               '-print key, inc position
6210  '**-inserting--**
6220  IF MID$(F.FIELD$,F.FL,1) < > " " GOTO 6280   '-can we insert?
6230  '**-insert key--**
6240  MID$(F.FIELD$,CN,F.FL-CN+1)  = CK$ +MID$(F.FIELD$,CN,F.FL-CN)
6250  LOCATE ,F.COL,0: PRINT LEFT$(F.FIELD$,F.FL);: CN=CN+1
6260  GOTO 6090
6270  '***---error beep---***
6280  SOUND 50,4: GOTO 6100
6290  '*** TCKI>0
6300  IF NOT INS GOTO 6330                         '-inserting?
6310  IF TCKI=82 GOTO 6620                         '-insert key?
6320  INS=FALSE: LOCATE ,,1,2,10
6330  IF TCKI<75 GOTO 6400                         '-nonspecial key?
6340  ON TCKI-74  GOTO 6470, 6400, 6500, 6400, 6680, 6400, 6400, 6620, 6570
6350                        '75        77        79              82    83
6360                        '<-        ->      <End>           <Ins><Del>
6370  IF TCKI=117 GOTO 6540                        '<-Ctrl-End>
6380  IF TCKI=115 THEN CN=1: GOTO 6090             '<-Ctrl-Lcurs>
6390  '***---EXIT---***
6400  LOCATE ,,0,2,10: GOSUB 6740                  '-get field from screen
6410  CKFIELD$=LEFT$(F.FIELD$,F.FL)                '-store in ckfield$
6420  CKFIELD.SW=FALSE                             '-turn off field switch
6430  RETURN '<--------------------- R E T U R N ---------------------->
6440  '
6450  '*** <Lcursor> - move cursor left within field        ***
6460                    'if cn = 1 then can't go left; buzz ***
6470  IF CN>1 THEN CN=CN-1:  GOTO 6520 ELSE GOTO 6280
6480  '*** <Rcursor> - move cursor right within field            ***
6490                    'if cn>=ckmax then can't go right; buzz ***
6500  IF CN<CKMAX-1 THEN CN=CN+1: GOTO 6520 ELSE GOTO 6280
6510  '*** Drop keys
6520  IF INKEY$>< "" GOTO 6520 ELSE GOTO 6090
6530  '*** < Ctrl >< End> - erase field from above cursor and to the right ***
6540  LOCATE ,,0: PRINT SPC(F.FL-CN+1);
6550  GOTO 6090
6560  '*** <Del> - delete character above cursor, shift remaining field to left
6570  ISTART=CN+1: T2=F.FL-CN
6580  IF T2>0 THEN GOSUB 6770                      '-get part of field from screen
6590  PRINT MID$(F.FIELD$,ISTART,F.FL-CN+1);" ";
6600  GOTO 6090
6610  '*** < Ins > - get into or out of insert mode
6620  IF INS THEN LOCATE ,,,2,10: INS=FALSE: GOTO 6100
6630  '**--Set cursor depending on display type--**
6640  IF DISPLAY=1 THEN LOCATE ,,,10,3 ELSE LOCATE ,,,6,1
6650  INS=TRUE: GOSUB 6740
6660  GOTO 6090
6670  '*** < End >- move cursor past last nonblank character
6680  GOSUB 6740                                   '-get field
6690  FOR CN=F.FL TO 1 STEP-1                      '-find last nonblank
6700    IF MID$(F.FIELD$,CN,1)< > " " GOTO 6720
6710  NEXT
6720  IF CN < > F.FL THEN CN=CN+1
6730  GOTO 6090
6740  '***---get field from screen 1 byte at a time using SCREEN function---***
6750  '***---if entering at line 6770, ISTART is set to position in field---***
6760  ISTART=1
6770  LOCATE ,,0                                   '-turn cursor off
6780  FOR I1=ISTART TO F.FL                        '-get field, one byte at a time
6790    MID$(F.FIELD$,I1,1)=CHR$(SCREEN(F.ROW,F.COL+I1-1))
6800  NEXT
6810  RETURN
```

▲

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BOARDS & BUSES

by Steve Schmitt

Last month's column dealt with the complex problem of evaluating Winchester disks for the Personal Computer. Continuing on that theme, this month we'll examine the 20M Hardfile from Tallgrass Technologies and IBM's new 10M Winchester drive.

The Hardfile. Tallgrass Technologies's 20M Hardfile, which comes as a separate unit, features an integral cartridge tape—a must for proper backup. The tape unit holds up to 12.5 megabytes on a single cartridge; disk and tape together give you a total of 32.5 megabytes on line, all at a cost of only $3,150.

Installing the Hardfile is easy. All the software routines provided by Tallgrass Technologies are menu-driven, including the configuration routine. The procedure leads you through several simple steps that allow specification of the number of logical units, the number of directories per logical unit, and the drive identifier (A:, B:, D:, and so on). You can also set duplicate directories and read-after-write attributes for the disk.

Duplicate directories are great for the rare occasion when a primary directory gets clobbered. The read-after-write option verifies that all write operations are reliably performed (100 percent correct). In environments that process critical data, these features are important; you do, however, pay a moderate performance penalty for them.

Like the Corvus drive discussed last month, the Hardfile comes with an interface board, a ribbon cable, and a separate power cord. Installation and configuration take only about twenty minutes, provided you've read the manuals. One warning: Placing the interface card in a Tecmar Expansion Unit may render the disk system inoperable. This probably is a result of the bus buffering or of some DMA anomalies of the Tecmar unit. If you do use an expansion unit, just place the board in one of the pc's slots.

Documentation for the Tallgrass system follows the industry standard: short and lacking in detailed information. The system comes with a thirty-four-page installation and user guide, an eleven-page technical reference manual, and a disk drive reference guide. Although the installation procedure is covered carefully and completely, the other aspects of the system are not. Considering the cost of a Winchester disk system, you have a right to expect more. Otherwise, however, this is a superlative product.

Perhaps the best feature of the Hardfile is the tape backup system. The tape unit is mounted in the front (for easy insertion of the DC 300XL cartridges), and a menu-driven tape utility controls tape motion, the saving and restoring of drives, and the checking of tape contents. It takes just under ten minutes to save a 10M logical unit. And the software automatically verifies all data written to tape. Because backup is such a vital function, a good mechanism, such as the Hardfile's, is essential.

The Hardfile is quite a performer, as you'll note from its performance statistics. Surprisingly, the two physical drive characteristics that usually have the most influence on performance—average seek time and transfer rate—are not particularly outstanding. Nevertheless, Tallgrass's figure of merit (see last month's column for an explanation of this concept) looks good; quality software and controller design are the key.

The function of the controller is the heart

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Test set	Hardfile to RAM
160K file	2.59 seconds
64 2K files	18.26 seconds
	RAM to Hardfile
160K file	3.57 seconds
64 2K files	34.16 seconds

	Performance gain over floppies	
	Read	Write
160K file	348%	269%
64 2K files	279%	368%

THROUGHPUT/CAPACITY FIGURE OF MERIT

Throughput: 7.7 accesses per second
Capacity: 19.67 million bytes
Performance (maximum): capacity × throughput = 19.67 × 7.8 = 151.5
Cost per performance unit: $3,150 / 151.5 = $20.79

HARDFILE PRODUCT SPECIFICATIONS

Cost: $3,150
Version date (TG-3000): February 1983, v3.05
Configuration requirements: 64K system memory, 1 160K drive
Storage specifications:
- 20.4 million bytes (unformatted)
- 19.7 million bytes (formatted)

Average seek time: 120 milliseconds
Peak transfer rate: 6.25 million bits per second
Rotational speed: 3,600 rpm
Documentation:
- Installation and user guide, 34 pages
- Technical reference, 11 pages
- Miniscribe product manual (drive), 35 pages

Package components:
- Winchester drive, integral cartridge tape, and power supply
- IBM pc interface board
- 1 160K floppy disk
- Installation program, software drivers, and diagnostics

Physical specifications:
- Height 5.5 inches
- Width 15.25 inches
- Depth 12.0 inches
- Two disk platters
- Disk diameter: 5.25 inches

Manufacturer:
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Table 1.

of the Hardfile. All disk-read requests result in the reading of an entire track, not just the specified sector. This approach is possible because the controller contains 40K of RAM (a track holds about 10K). Also, if an operation requests data that's already in the RAM buffer, no disk access is actually performed. Because it avoids unnecessary disk reads, the Hardfile did particularly well on our second performance test, where the disk was asked to read sixty-four 2K files. Every second disk access in this test is to the directory track—which the Hardfile keeps in its controller RAM.

Table 1 summarizes the Hardfile's performance characteristics.

The IBM 10M Drive. IBM has finally provided a hard disk of its own for the pc. Its advantage, at least in the short term, is that it works with DOS 2.0. Because this disk was tested with a different version of the operating system (the Tallgrass and Corvus disks were tested with DOS 1.1), comparisons may be a little inexact, but they should give you a general idea of how the XT measures up.

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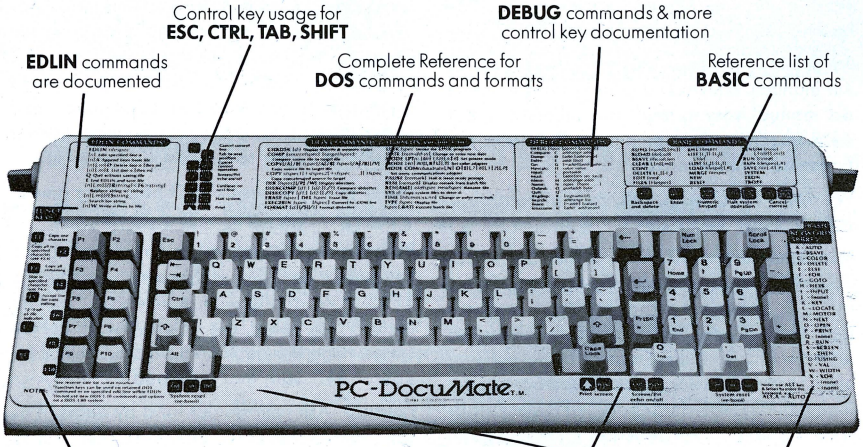

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Test set	Disk to Nul:	Performance gain over floppies Read	Write	Figure of merit ($/unit)
Tallgrass Hardfile	11.12 seconds	409%	430%	$20.79
IBM	18.26 seconds	222%	401%	$26.50
Corvus	18.26 seconds	44%	226%	$76.90

IBM THROUGHPUT/CAPACITY FIGURE OF MERIT
Throughput: 10 accesses per second
Capacity: 10.65 million bytes
Performance (maximum): throughput × capacity = 106.5
Cost per performance unit: $26.50

Table 2.

The IBM hard disk can occupy the space normally used by a floppy disk drive, or it can be placed in the new IBM expansion unit. If you have a standard (pre-XT) pc and you want to add the hard disk to its system unit (instead of getting the expansion unit), you'll first need to replace the system power supply with a heavier-duty model. And, of course, you'll need the new hard disk controller board. The controller board supports two 10M disks.

All told, upgrading an existing pc, without getting the expansion unit, costs approximately $2,800 (not including the cost of a new system ROM and DOS 2.0); upgrading by means of the expansion unit costs about five hundred more. The other way to get the hard disk, of course, is simply to buy an XT (for about five thousand dollars).

IBM supplies two software routines to back up the hard disk: *backup* and *restore*. Both these DOS commands transfer data between the hard disk and floppies; as mentioned in April, backup to floppy is not the most efficient way to protect a Winchester's data.

A configuration utility is also provided. A really nice feature of this software allows you to specify additional memory buffers for file operations. This can significantly enhance disk operation.

Because none of the RAM disk software for DOS 1.1 works with version 2.0, the standard performance tests could not be run with the new IBM disk. Therefore, the test was modified slightly. Instead of writing to RAM, the copy output was directed to device Nul: (also known as the bit-bucket—a dumping ground for unwanted data). This procedure avoided the extraneous factors associated with writing to a real device or disk drive. Note, though, that this approach is useful only for reading the disk, not for writing to it.

Results of the modified performance tests are shown in table 2. Figure-of-merit values accompany the test findings.

The Effect of DOS 2.0 on Disk Systems. DOS 2.0 has some valuable new features, especially the file system enhancements. A hierarchical file system, redirectable I/O, and Unix-like pipes add some real punch. A nice addition is the capability to use an external terminal for control of the pc—very handy if you're calling in over a modem.

All these improvements impact software that relied on the structure of DOS 1.1. Such programs won't work with DOS 2.0. This includes hard disk systems, RAM drives, and some application-software products. Before long, however, most manufacturers will be offering updates to keep abreast with IBM. ▲

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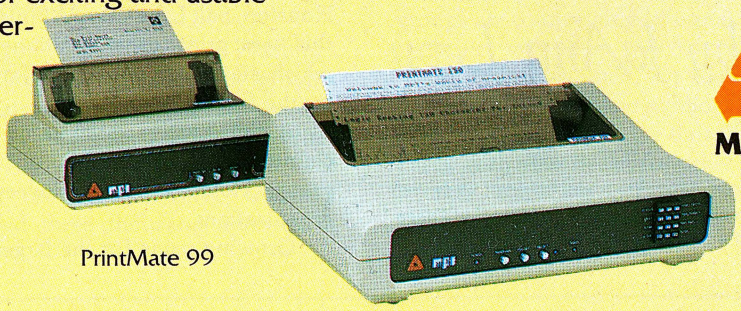

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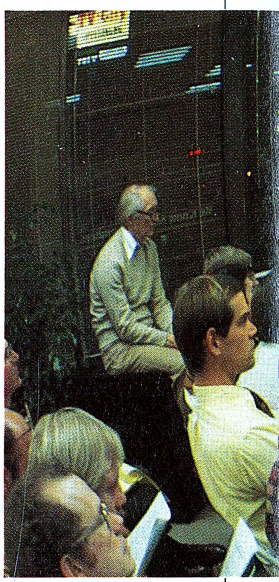
A Little More Help from Your Friends

by JoAnn Levy

What do Silicon Valley engineers, North Dakota farmers, and D.C. architects have in common? If you guessed IBM pcs, you're right, and if you guessed user groups, you're right again. Right after their computers, pc users are keen on other pc users, or so it seems from the numbers of them flocking together to share information, problems, and programs.



Less than a year ago, a survey turned up forty groups (*Softalk*, July 1982). That number has now more than doubled, while club membership has tripled and then some. Representative is John Field's San Diego group, which, in ten months, increased its forty members to one hundred fifty. This March, one hundred fifteen of them jammed the local ComputerLand showroom to hear Peter Norton discuss everything from his utility programs to peanuts and popcorn.

"When we have a speaker like Peter," says Field, "space becomes a real problem. When I started this, I thought maybe twenty or thirty. We've got one hundred fifty now and could probably double that by next year. And now that we're getting out and contacting high-powered speakers, we need an auditorium; we've outgrown ComputerLand."

The membership of some clubs is in knock-your-socks-off numbers. In one year, California's Silicon Valley club mushroomed from six members to five hundred. One of New York City's three clubs gained two hundred members following a write-up in the *Times*, and now numbers seven hundred. Washington, D.C.'s, Capitol PC Users' Group, which started with twenty-six in February 1982, now boasts thirteen hundred members. But the high score goes to the Boston Computer Society: Its IBM pc interest group recently tallied 1,870 members.

Other groups with one hundred or more members can be found in Phoenix, Seattle, Tucson, San Diego, San Francisco, Portland, southwest Connecticut, Atlanta, Chicago, Ann Arbor, Minneapolis, Long Island, Cincinnati, Philadelphia, Houston, Salt Lake City, Winnipeg, Toronto, and, by the time this sees print, other locations as well. Cleveland's group, which started organizing in January, fielded sixty members by the first of March.

A conservative estimate of total membership across the country is ten thousand, not counting corporation-based groups closed to nonemployees or affiliation with national organizations.

Growing pains for the larger groups, which long ago ex-

Opposite page: It's standing room only as the rapidly growing San Diego user group packs ComputerLand's showroom to hear Peter Norton.

ceeded capacity limits at the local ComputerLand, are manifested mainly in a constant scramble for meeting places. Joe Rigo of New York City credits the "right place, right time, right computer" for his group's growth but confesses that it's becoming a "monthly circus" to seat the turnout. They're meeting in a college lecture hall that accommodates one hundred thirty, with a usual show of one hundred eighty. Plans are in the works for dividing into two meeting rooms, with split programs.

Randy Bullard's Atlanta group meets at the county courthouse for free. The problem of no-cost meeting places plagued the Phoenix group until it settled on a smorgasbord restaurant. High school gymnasiums, community rooms at banks, company cafeterias, and public libraries all serve. The behemoth Capitol group descends monthly, some five hundred or more strong, on Bethesda's naval hospital; the Boston group on MIT.

What do all these folks do besides compliment one another on their taste in name-brand computers? Question-and-answer periods are probably the reason most members join. Saul Lowitt of Florida's Manasota group boasts proudly, "We've never had a question that someone couldn't answer."

Most groups have a standard format of speakers, demonstrations, and reviews. Variations on the theme include special-interest discussions, videotaping presentations to exchange with other clubs, and providing overhead monitors so all members can see the screen. Fringe benefits include newsletters and membership directories, some listing each member's equipment so like can talk with more like.

Most clubs are especially proud of their software libraries, whether the programs are written by members or accessed from bulletin boards, the method used by the Fargo, North Dakota, club.

The bulletin board prize goes, hands down, to Washington, D.C.'s, Capitol Users' Group. Mike Todd, the group's organizer and now official chairman of the board, reports that it has "eleven or twelve." On February 20, Todd held his first national IBM pc users' telecommunication conference through CompuServe, with thirty participants; within a month, CompuServe recorded three thousand accesses to GO-PC-131.

Group purchasing is often a club objective. Capitol caused a small ruckus with its group buy of Quadram boards when members negotiated a price less than dealers were paying. Todd reports that the group now "won't do business at less than dealers' prices." Dave Foulger says his two-hundred-fifty-member Southwest Connecticut group—one of the oldest, organizing in November 1981—avoids club buying and accompanying difficulties. But Marvin Freifeld is "trying to break the cycle of high prices" by asking manufacturers to use his Long Island group for beta testing, and reports "some cooperation."

The energetic Portland group, with some eighty of its one hundred twenty members regularly getting together, supplies a consultant list to computer stores, takes a booth at computer fairs, and actively supported Oregon state senator Jeannette Hanby's proposed computer-literacy legislation.

Business and technical people comprise most clubs, but Ron Kester of Pittsburgh's South Hills Computer Club reports that ten of its members are "children chauffeured by parents." South Hills offers family rates so mom and dad can learn a few things, too.

Which brings up the subject of dues. Almost all clubs want them, primarily to pay for newsletter printing, postage, and other organizational costs. One club demands that members be paid up just to get in the door. Two North Dakota groups share both a newsletter and a software library, with a "no-programs-without-dues" policy. Terry Alley of South Bend, Indiana, reports that the northern Indiana group, which levies no dues, solved its fund-raising problem by buying wholesale disks in lots of one hundred, which they sell to themselves at $2.50 over cost.

Regardless of dues practices, size, or meeting place, most groups are comfortably informal, with everyone from novices to techies more than welcome.

So following, then, for the unaffiliated, are the IBM pc user groups open to the public. The list is not exhaustive; new groups are forming all the time. If there's no club in your area, check with your dealer for other pc owners and start one. All it takes, according to David Nussbaum of one of southern California's San Fernando Valley groups, is "one lunatic with two friends."

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John Field, San Diego: "I just wanted to be one of the members."

David Nussbaum, San Fernando Valley: "I opened the book and said 'Huh?'"

USER GROUPS: WHERE AND WHEN

The name, in each case, is a contact person, followed by mailing address, not *meeting address. Call for further information.*

ALABAMA

Birmingham. Chet Ellis, ComputerLand, 215 West Valley Avenue, Birmingham, AL 35209; 205-942-8085. Meets first Saturday; dues $20 per year; newsletter.

Mobile/Pensacola. Jim McGinnis, 124 Meadow Wood Loop, Daphne, AL 36526; 205-626-9558. Meets third Saturday.

ALASKA

Anchorage. Mark Bolzern, General Computer Services, 213 West Sixth Street, Anchorage, AK 99501; 907-338-6263. Meets third Thursday; dues $10 per month; bulletin board.

ARIZONA

Mesa/Tempe. Margaret Mead, 2119 East Pueblo, Mesa, AZ 85204; 602-892-8008. Meets monthly; $5 membership fee; newsletter.

Phoenix. Fred Linch, Phoenix IBM PC Users' Group, Box 44218, Phoenix, AZ 85064; 602-266-6634. Meets third Tuesday; dues $12 per year; newsletter; SIGs.

Tucson. Theresa Baudier, Box 1489, Tucson, AZ 85702; 602-293-0611. Meets third Tuesday; dues $10 per year; newsletter.

ARKANSAS

Little Rock. Wally Anderson, Razorback PC Club, 3000 Cleburne, North Little Rock, AR 72116; 501-758-0148. Meets first and third Mondays; dues $15 per year.

CALIFORNIA

East Bay Area. Mark Turrin, Diablo Valley PC, 416 Kahrs Avenue, Pleasant Hill, CA 94523; 415-937-9378. Meets first Wednesday; dues $25 per year; newsletter.

Fresno. Raul Betancourt, 6750 North Woodrow, Fresno, CA 93710; 209-294-2788. Meets first Monday; dues $15 per year; newsletter.

Los Angeles. Neil Zachary, Box 4136, Los Angeles, CA 90028; 213-937-1314. Meets second Tuesday; dues $35 per year; newsletter.

Marin County. William O. Ward, 21 Tamal Vista Boulevard, Suite 186, Corte Madera, CA 94925; 415-927-1212. Meets last Tuesday; dues $25 per year; newsletter; bulletin board.

Modesto. Liz Leedom, Box 1122, Modesto, CA 95353; 209-578-2358. Meets first Thursday; newsletter.

North Orange County. NOCCC IBM PC Users' Group, Box 3616, Orange, CA 92665; 714-998-8080. Interest group of North Orange County Computer Club; meets first Sunday; dues $15 per year; newsletter.

Orange County. Glenn A. Emigh, 1533 Sherwood Village Circle, Placentia, CA 92670; 714-996-4464. Meets second Wednesday.

Sacramento. Dave Burhans, Jr., 8122 Holm Oak Way, Citrus Heights, CA 95610; 916-723-9745 (evenings). Meets third Wednesday; dues $10 per year; newsletter; SIGs.

San Bernardino. Lou Bednorz, Inland PC

USRGP, 23147 Palm Avenue, Grand Terrace, CA 92324; 714-825-9660. Call for information.

San Carlos. Tex Thoman, Peninsular IBM-PC Users' Group, 376 El Camino Real, San Carlos, CA 94070; 415-593-8275. Meets first Saturday.

San Diego. John Field, Box 87770, San Diego, CA 92138; 619-421-9686. Interest group in San Diego Computer Society; meets third Tuesday; newsletter.

San Fernando Valley. David Nussbaum, 11558 Riverside Drive, Suite 207, North Hollywood, CA 91602; 213-985-8337. Meets first Tuesday; dues $15 per year; newsletter.

San Fernando Valley. Ray Kirk, 5923 Murietta, #2, Van Nuys, CA 91401; 213-994-3811. Meets second Thursday; dues $15 per family.

San Francisco. SF IBM PC Users' Group, Box 4411 Geary Boulevard, Suite 13, San Francisco, CA 94118. Meets third Monday; dues $20 per year; newsletter; SIGs; write for information.

San Francisco. Max Brioski, SFPCC, 1732 Washington Street, Suite 4, San Francisco, CA 94109; 415-775-8882. Meets every fourth Thursday; dues $15 per year; newsletter.

San Jose. Syd Geraghty, 7219 Shea Court, San Jose, CA 95139; 408-629-9402. Call for meeting information; dues $25 per year; newsletter.

Santa Barbara. Stu Swartz, 721 Cliff Drive, Santa Barbara, CA 93109; 805-966-2919. Meets third Thursday; dues $10 per year.

Santa Cruz. Dave Roehr, ComputerLand, 1955 Forty-first Avenue, Capitola, CA 95010; 408-476-6170. Call for information.

South Bay. Michael A. Immel, Box 665, Lomita, CA 90717; 213-647-2739 (days), 213-325-7533 (evenings). Write or call for meeting information; dues $20 per year; newsletter.

Sunnyvale. Nancy Nehring, Silicon Valley Computer Society, Box 60506, Sunnyvale, CA 94088; 408-984-2558 (evenings), 408-980-8519 (days). Meets second Wednesday; dues $30 per year; newsletter; SIGs.

Thousand Oaks. Norm Blessum, 171 East Thousand Oaks Boulevard (ComputerLand), Thousand Oaks, CA 91360; 805-492-1003. Meets fourth Thursday; dues $10 per year; newsletter.

COLORADO

Boulder. Steve Leibson, 4040 Greenbriar Boulevard, Boulder, CO 80303; 303-494-4062. Interest group in Denver Amateur Computer Society; dues $12 per year; newsletter.

Denver. Chris Van Essen or Chris Carson, Rocky Mountain PC Interest Group, 8972 East Hampden Avenue, Suite 169, Denver, CO 80231; 303-694-9038. Meets every third Wednesday.

CONNECTICUT

Southwest. Dave Foulger, 69 River Street, New Canaan, CT 06840; 203-966-9378. Meets fourth Tuesday; newsletter subscription, $5.

West Hartford. Rich Paterson, ComputerLand, 131 South Main Street, West Hartford, CT 06110; 203-561-1446. Meets first Wednesday; newsletter.

FLORIDA

Boca Raton. Wyatt Bell, College of Boca Raton, 3601 North Military Trail, Boca Raton, FL 33431; 305-994-0770, ext. 14 or 83. Call for information.

Sarasota. Richard Reynolds, Manasota IBM-PCUG, 1102 Mallorca Drive, Bradenton, FL 33529; (813) 792-5400. Meets third Wednesday; dues $15 per year; newsletter.

GEORGIA

Atlanta. Randy Bullard, 2965 Atterberry Court, Decatur, GA 30033; 404-634-9585. Meets second Wednesday; dues $20 per year; newsletter.

HAWAII

Honolulu. Doug Long, 1750 Kalakaua, Suite 3-168, Honolulu, HI 96826; 808-735-5769. Meets second Tuesday; dues $10 per year;

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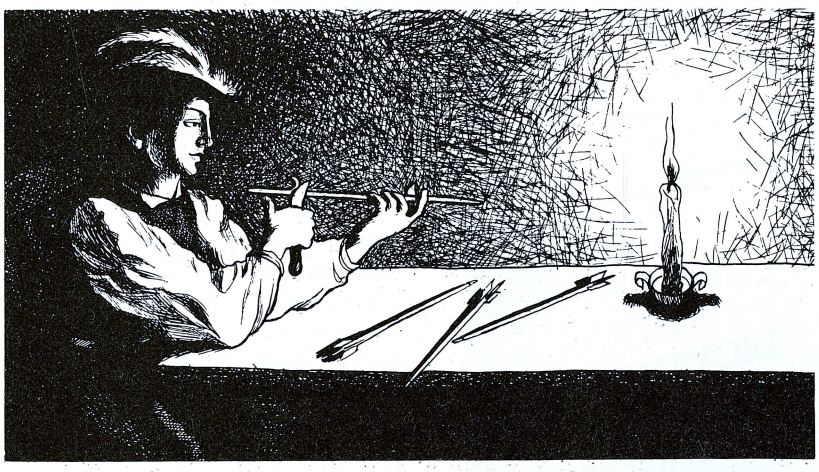

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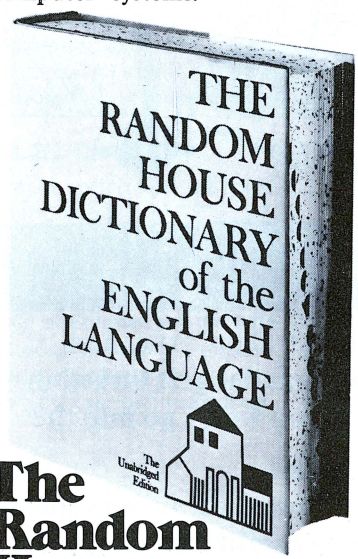

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IDAHO

Boise. Bruce Burns, ComputerLand, 11872 Chinden Boulevard, Boise, ID 83704; 208-939-2433 (evenings). Call for information.

ILLINOIS

Chicago. James L. Szafranski, 5195 Castaway Lane, Barrington, IL 60010; 312-934-8133. Meets second Thursday; dues $15 per year.

INDIANA

Fort Wayne. George Gynn, 9904 West Goshen Road, Fort Wayne, IN 46818; 219-693-3147. Meets third Tuesday; dues $15 per year; newsletter.

Indianapolis. David Reed, 6704 Hoover Road, Indianapolis, IN 46260; 317-259-7892. Meets fourth Monday; dues $15 per year single, $20 family; newsletter.

South Bend. Terry Alley, M.D., Northern Indiana IBM PC Users' Group, 316 North Ironwood, South Bend, IN 46615; 219-289-5506 (days), 219-291-3979 (evenings). Autumn Revolution chapter.

IOWA

Cedar Falls. Lee Ann Moore, ComputerLand, Black Hawk Village Shopping Center, Cedar Falls, IA 50613; 319-277-1700. Meets first Monday.

Des Moines. Gary Wilcox, Box 246, Des Moines, IA 50301; 515-967-5880. Call for information.

KANSAS

Kansas City. Dr. R. Wayne Thompson, 11005 West Sixtieth Street, Shawnee, KS 66203; 913-631-0110. Meets first Monday; dues $15 per year; newsletter.

Topeka. Becky Hinton, Topeka Public Library, 1515 West Tenth Street, Topeka, KS 66604; 913-233-2040. Meets third Monday.

KENTUCKY

Louisville. Clyde Jenkins, 680 Fourth Avenue, Louisville, KY 40202; 502-584-8157. Call for information.

LOUISIANA

New Orleans. Bob Starr, ComputerLand, 3517 Nineteenth Street, Metairie, LA 70002; 504-588-6276. Meets first and third Wednesdays; dues $18 per year; bimonthly newsletter.

MAINE/NEW HAMPSHIRE

Portsmouth. Cynthia Harriman, 57 South Street, Portsmouth, NH 03801; 603-436-1608. Call for information.

MARYLAND

Baltimore. Ed Honabach, Baltimore IBM PC Users' Group, 1910 Trout Farm Road, Jarrettsville, MD 21084; 301-666-6344 (days), 301-557-9965 (evenings). Meets first Tuesday; dues $10 per year; newsletter.

Baltimore. Chip Hayden or Alan Burke, IBM PC Business Users, 40 West Chesapeake Avenue, Suite 300, Baltimore, MD 21204; 301-296-4600. Monthly SIG meetings; semiannual conference.

MASSACHUSETTS

Boston. Mike Rohrbach, Box 307, Wellesley Hills, MA 02181; 617-235-8830. Interest group in Boston Computer Society; meets second Thursday; dues $20 per year; monthly magazine; bulletin board.

MICHIGAN

Ann Arbor. Will Weber, Box 7545, Ann Arbor, MI 48107; 313-665-4407. Meets third Thursday; dues $18 per year, $12 for students and seniors; newsletter; bulletin board.

MINNESOTA

Minneapolis. Peter LeNeau, Box 3163, Minneapolis, MN 55403; 612-339-9071. Meets second Tuesday; dues $10 per year; newsletter.

MISSOURI

Saint Louis. Dave Zumbro, Box 837, Saint Louis, MO 63188. Meets first Tuesday; dues $35 per year; newsletter.

NEW JERSEY

Central. Mike O'Donnell, Box 42, Fanwood, NJ 07023; 201-754-7263. Interest group in Amateur Computer Group of New Jersey. Meets first Friday; dues $14 per year; newsletter.

North. Irving Lang, North Jersey IBM PC, 7 West Forty-fifth Street, New York, NY 10036; 212-869-5066, or Joe McDermott, 201-489-3877 (evenings). Meets second Thursday; dues $20 per year, family rates; newsletter.

NEW YORK

Buffalo. Linda Fall, 265 Kings Highway, Snyder, NY 14226; 716-839-0574. Meets second Monday; dues $20 per year; newsletter; bulletin board.

Long Island. Marvin Freifeld, 3 Lindron Avenue, Smithtown, NY 11787; 516-724-0574. Interest group of Long Island Computer Association; meets second Friday; dues $10 per year; newsletter; SIGs.

New York City. David Gillett, 687 Broadway, New York, NY 10012; 212-254-9191. Interest group in New York Amateur Computer Club; meets third Wednesday; dues $10 per year.

New York City. Eric A. Jaffe, Cornell Medical University, 1300 York Avenue, New York, NY 10021; 212-472-6140. Meets third Wednesday; dues $10 per year; SIGs.

New York City. Helaine Head, Manhattan Micro, 360 Central Park West, New York, NY 10025; 212-222-9027. Meets first Monday; newsletter.

Rochester. Dale Dewey, Picture City PC Programming Club, 7284 High View Trail, Victor, NY 14564; 716-924-5565. Meets first Wednesday; dues $12 per year; newsletter.

White Plains. Dave Hodgson, 822 Pines Bridge Road, Ossining, NY 10562; 914-762-5248. Meets first Thursday; dues $15 per year; newsletter.

NORTH DAKOTA

Fargo. Loren D. Jones, 1339 Seventh Avenue South, Fargo, ND 58103; 701-235-7573 or 701-280-2608. Meets third Monday; newsletter.

Grand Forks. John D. Hilley, 717 Ives Street, Buxton, ND 58218; 701-847-2935. Meets first Thursday; joint newsletter with Fargo club.

OHIO

Akron/Canton. Raymond H. Schilling, Stark Technical College, 6200 Frank Avenue N.W., Canton, OH 44720; 216-494-6170. Meets first Monday; dues $10 per year; newsletter.

Cincinnati. Jerry Daiker, Box 3097, Cincinnati, OH 45201; 513-741-8279. Meets third Tuesday; dues $15 per year; newsletter.

Cleveland. Roy McCartney, Greater Cleveland PC UG, 30704 Royalview Drive, Willowick, OH 44094; 216-944-5173. Meets first Saturday; dues $15 per year; newsletter.

Youngstown. Eugene Rhodes, ComputerLand, Western Reserve IBM-PC, 2000 North Road S.E., Warren, OH 44484; 216-544-4191. Meets second Tuesday; dues $15 per year, individuals, $20 families, $25 businesses; newsletter.

OKLAHOMA

Tulsa. Walt Hailey, Box 1133, Tulsa, OK 74101; 918-663-2693. Interest group in Tulsa Computer Society; meets third Monday; dues $10 per year; newsletter; bulletin board.

OREGON

Eugene. Greg Estes, Box 5070, Eugene, OR 97405; 503-687-0398. Meets third Thursday.

Portland. Rich Rohde, 12260 Southwest 124th Street, Tigard, OR 97223; 503-620-6862. Meets second Wednesday; dues $20 per year; newsletter; SIGs.

PENNSYLVANIA

Philadelphia. Bennett Landsman, 2041 Harbour Drive, Palmyra, NJ 08065; 609-786-1441. Interest group in Philadelphia Area Computer Society; meets third Saturday; dues $22 per year; newsletter.

Pittsburgh. Chuck Glassmire, 29 Coulter Street, Pittsburgh, PA 15205; 412-922-1022. Interest group in Pittsburgh Area Computer Club; meets third Sunday; newsletter.

Pittsburgh. Victor Merrell, South Hills Computer Club, 1692 Northgate Drive, Pittsburgh, PA 15241; 412-221-6383. Meets second Thursday; $15 initiation, dues $10 per year, family rates; newsletter.

SOUTH DAKOTA

Rapid City. Gary Gall, ComputerLand, 738 Saint Joe Street, Rapid City, SD 57701; 605-348-5384. Call for information.

TENNESSEE

Knoxville. Wayne Morrison, 853 West Woodchase, Knoxville, TN 37922; 615-966-1474. Meets second Monday; dues $10 per year; newsletter.

Knoxville. Ross Burrus, Science Applications, Knoxville Independent Users' Group, Plaza Tower, Suite 801, Oak Ridge, TN 37830; 615-482-6649. Call for information.

TEXAS

Austin. Charles Weller, Central Texas IBM PC UG, 325 Explorer, Austin, TX 78734; 512-261-6566. Meets first Tuesday; dues $35 per year; newsletter.

Dallas. Alan C. Elliott, North Texas IBM PC UG, 1028 North Madison Avenue, Dallas, TX 75208; 214-688-2767 (days), 214-941-8475 (evenings). Meets third Saturday; dues $24 per year; newsletter.

Dallas/Fort Worth. Samuel P. Cook, Southwest PC UG, 309 Lincolnshire, Irving, TX 75061; 214-253-6979. Meets third Saturday; dues $30 per year; newsletter; SIGs.

Houston. Rob Taylor, Houston Area League of PC Users, 8023 Shady Grove, Houston, TX 77040; 713-937-3592. Meets first Tuesday; dues $25 per year; newsletter; bulletin board.

San Antonio. Mike Sullivan, Alamo PC Organization, 4807 Clemson, San Antonio, TX 78249; 512-828-7926. Meets first Thursday; dues $15 first year, $10 thereafter.

San Antonio. Ken Holcombe, Texas Users' Group, 178 Tipperary, San Antonio, TX 78223; 512-333-7163. Call for information.

UTAH

Salt Lake City. Dean Bishop, Utah Blue Chips, Box 11901, Salt Lake City, UT 84147; 801-355-4617 (days), 801-561-3417 (evenings). Autumn Revolution chapter; meets third Wednesday.

VIRGINIA

Richmond. Jim Love, Central Virginia Users' Group, Box 34446, Richmond, VA 23234; 804-271-6173. Meets fourth Thursday; dues $20 per year; newsletter.

WASHINGTON

Olympia. Dr. Roger Kuhrt, 2030 Baker Terrace, Olympia, WA 98501; 206-943-8755. Call for information; newsletter.

Seattle. Sandra Stowell, PNW IBM Users' Group, Box 3363, Bellevue, WA 98009; 206-226-2578. Meets third Saturday; dues $10 per year; newsletter.

Spokane. Maurice Feryn, Route 1, Box 394, Mead, WA 99021; 509-466-3685. Meets last Tuesday.

WASHINGTON, D.C.

Mike Todd, Capitol PC Users' Group, 1414-C Wright Circle, Bolling AFB 20336; 202-561-5187 or 202-433-4380. Meets third Monday; dues $25 per year; newsletter; SIGs; bulletin boards (300 baud), 703-560-0979.

WEST VIRGINIA

Charleston. Farris VanMeter, ComputerLand, 224 Seventh Avenue, South Charleston, WV 25303; 304-744-7962. Meets first Wednesday.

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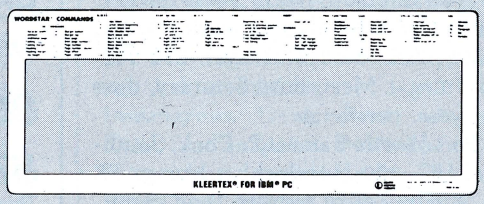

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OTHER

Amateur radio buffs interested in pc/radio applications such as Teletype and Morse code should contact Alvin J. Loeckle, Jr., 10338 Sagplum, Houston, TX 77089; 713-481-0736. ▲

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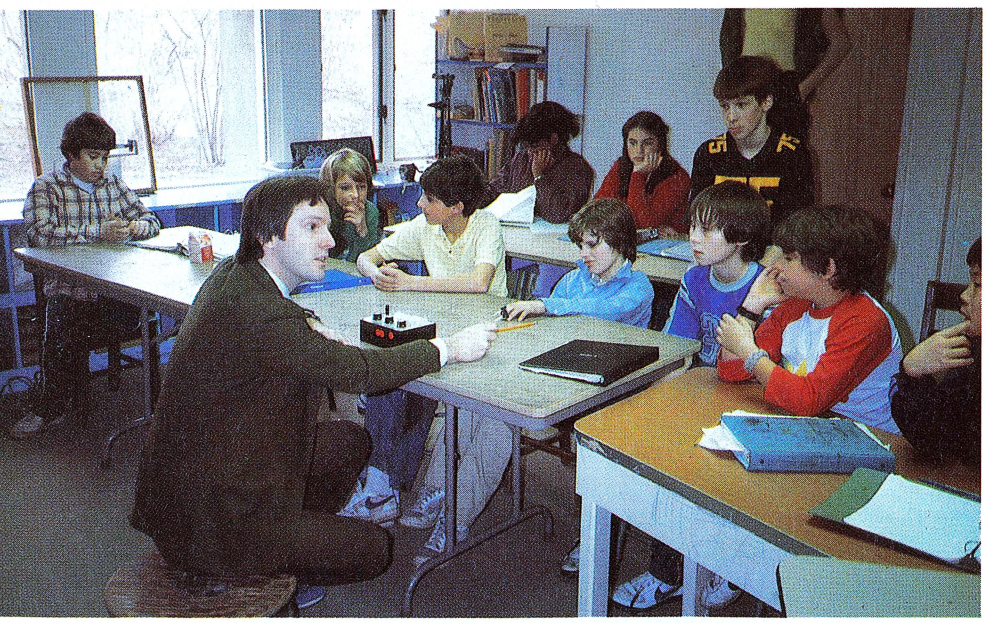
by Roe R. Adams III

TOM SNYDER
Teaching the Future Today



The setting is a fifth-grade classroom in a Cambridge, Massachusetts, private school. The year, 1980. An experiment is in progress here. Everyone in the class is standing up, holding hands and forming a large, irregular loop. At one end of the loop, two students standing next to each other are grasping the poles of a galvanometer, and the galvanometer is emitting a weak electric current. Each time the current moves completely through the human circuit, a buzzer sounds.

Although it's fun to participate in and interesting to watch, this part of the experiment isn't especially impressive. But now the teacher moves the students around, regrouping them into two parallel lines. The circuitry is rigged so that the buzzer buzzes only when there's a closed circuit in each of the two lines. Voila, a human *and* gate. From *and* gates to *or* gates to *xor* gates, the class literally walks through all the fundamental elements of a complex logic machine. The basics of computer science are absorbed by fifth-graders.

This educational breakthrough took place at a private school called Shady Hill. The teacher was Tom Snyder, author of the critically acclaimed *Snooper Troops* programs.

Thomas F. F. Snyder, thirty-three, graduated from Swarthmore College with a Bachelor of Arts degree and from Leslie College with a master's degree in education and an abiding love of rock 'n' roll. Following the siren call of late-sixties pop music, Snyder became a recording artist with Capitol Records in 1968. Four years later he retired from the record business—temporarily, at least—to teach science and music at Shady Hill.

Shady Hill follows the open classroom model that became popular in the sixties. The school's biggest innovation has been the development of the concept of the *central subject*. Each grade follows one theme throughout an entire school year. Fourth-graders study the Greeks, while fifth-graders delve into the Middle East. Higher grades concentrate on Africa, American history, India, and the twentieth century in overview. Each of the usual major courses—art, science, social studies—is related to the central subject of a particular grade.

In keeping with the school's basic educational philosophy, Snyder was not told what to teach, or how to teach. When he was hired, he was told only "to learn, work hard, experiment, and explore new approaches."

Teachers at Shady Hill work with the same children for several years. Snyder gets to know kids when they start the fifth grade and teaches them until they complete the seventh, resulting in a strong teacher-student rapport. Snyder attributes the scope of his accomplishments as an educator to this nurturing environment.

Educational Robotics. One of Snyder's earliest educational innovations was Personk, a two-part machine consisting of a small mobile robot and a primitive computer resembling a wooden octopus. The computer has a round column in the center and angled arms radiating off the top. Each arm has controls that affect the robot's movement.

This simulation calls for the participation of ten children, assigned to positions A through J. (Snyder chose K to represent the simplified computer; hence, the name Personk.)

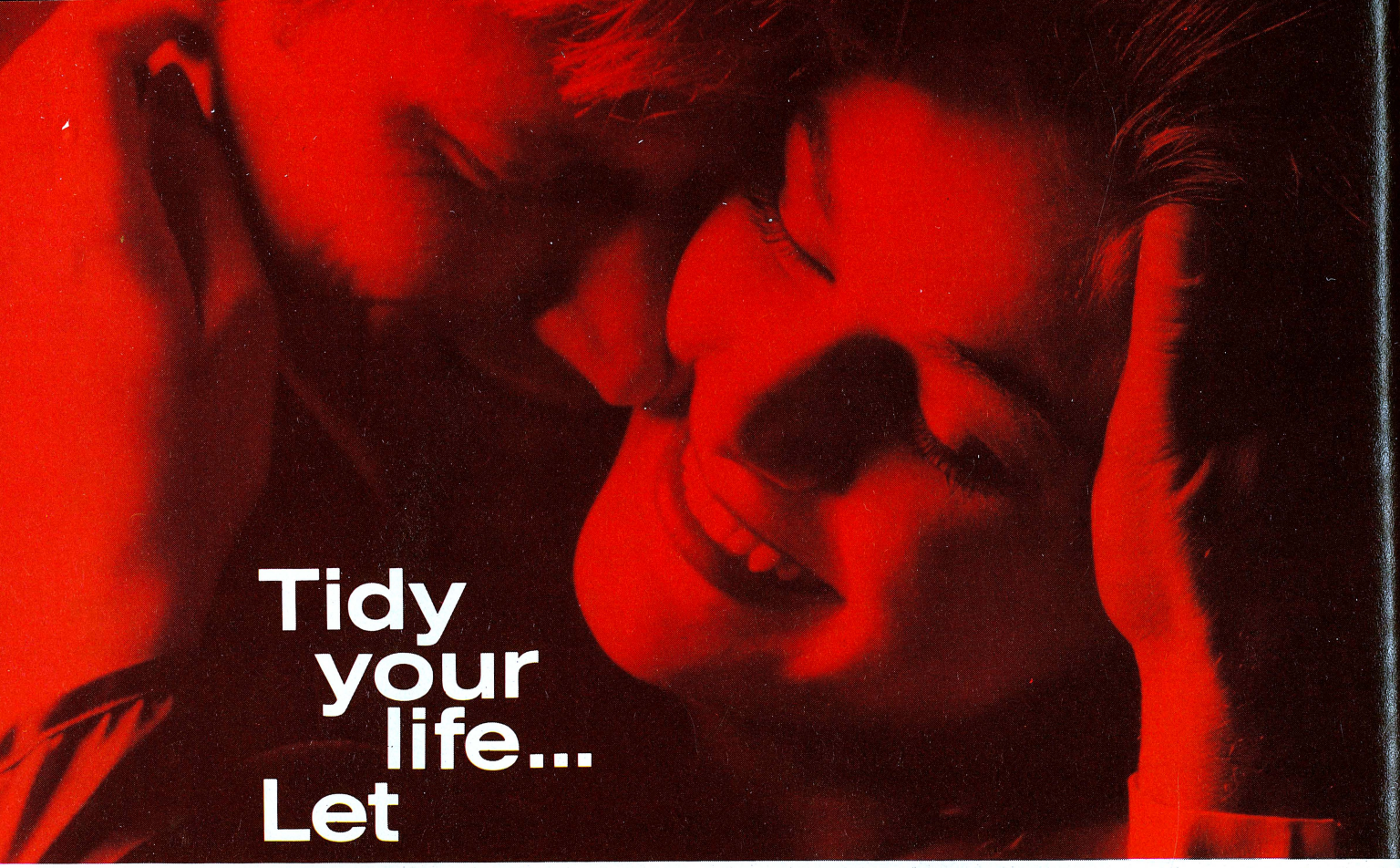
The children's objective is to get the robot, located in another

Illustration by Weldon O. Lewin

room out of sight, to accomplish a particular task. Each student receives feedback for his controls but is not told what aspect of the robot he is controlling. Therefore, cooperation is essential.

Personk was so successful that Parker Brothers expressed an interest in acquiring Snyder's design. Snyder agreed to a meeting in January of 1978 with that company's head of game acquisitions. In preparation for the meeting, Snyder put tremendous effort and many dollars into making Personk more attractive. When he arrived at Parker Brothers, Snyder discovered that he had confused the dates; the meeting had been scheduled for the day before.

"It took me only a few moments to realize that subconsciously I had decided to miss the meeting. I just wasn't ready to leave the known, comfortable world of teaching to enter the intense, competitive world of business." Snyder did, however, seek a new outlet



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for his creative talents. He turned to microcomputers.

Snyder's first computer was a Radio Shack Model I, which he bought in late 1978. He adapted Personk to the computer, then began to experiment again. The software simulations he started developing for his classroom turned out to be quite different from anything that had been done before for microcomputers.

Wariness of the drill-and-practice approach to educational software led Snyder to conceive of the learning environment. For the first time, the social side of microcomputers—group participation and student collaboration—were the focus of the software. The emphasis was on group dynamics and basic skills rather than on the actual use of the computer.

"The computer is intended to be a servant or a tool," observes Snyder. "I prefer to have students take an active role with the computer, by making them responsible for keeping track of information and having them work together in small groups."

In 1980, on the advice of Harvey Brudner, formerly head of Westinghouse Learning, Snyder signed a contract with McGraw-Hill to produce the Search Series.

The Search Series consists of five simulations for fifth through twelfth-graders. The subjects covered are geography, geology, community relations, energy exploration, and archaeology. Each program in the series is designed to be used with an entire classroom, and all class record-keeping is handled on disk. Each student receives a special workbook in which to record observations and data, and each student participates in an in-depth educational adventure.

The Computer Learning Connection. Becoming more involved in the creation of educational software led Snyder to form Computer Learning Connection in 1980. A little venture capital got the company off the ground, and two part-time programmers helped produce the software. *Snooper Troops: The Granite Point Ghost* would be the company's first offering.

At the time the new company was formed, Ann Waddington Snyder, Tom's wife, was teaching fifth grade at Shady Hill. Her class served as a developmental ground for *Snooper Troops*. In its original form, the program was a group activity. Twenty detective students were running all over the computer-generated town, independently gathering clues. At recess, everyone got together and compared notes.

In 1981, Rick Abrams joined the company to handle product marketing and to ease Snyder's workload. At this point Snyder began redesigning *Snooper Troops*. The revised version preserved the Hardy Boys-Nancy Drew flavor of the original but allowed one or two children, as well as groups of children, to solve the mysteries.

In 1981, Bank Street College in New York and an organization called Intentional Educations asked Snyder to do some simulations for a proposed television adventure series. Software was to be used in the federally funded project. One module Snyder created simulated the events involved in navigation. Groups of kids using it pretend they are on ships looking for whales to study. In the process they learn to use radar, sonar, and a telescope, and how to do detailed mapping. As is the case in most of Snyder's work, cooperation is of the utmost importance here.

The following year, a newly formed publishing company called Spinnaker Software was seeking innovative educational software. Snyder's first two *Snooper Troops* adventures, *The Granite Point Ghost* and *The Disappearing Dolphin*, were the company's first acquisitions. Both programs were highly successful.

William Bowman, chairman of Spinnaker, attributes the success of the *Snooper Troops* programs to the fact that they combine fun with solid learning. "Students are taught the fundamentals of note-taking and data organization while they are having a good time."

This past February, Snyder reorganized his company into Tom Snyder Productions and relocated it just off Harvard Square in Cambridge. Here, Snyder has dozens of play-testers eager to try out his ideas. Among them are students from several nearby Cambridge schools, as well as children from Shady Hill. The kids go to Snyder's offices after school and play-test the games he is working on, an arrangement that has provided valuable feedback to Snyder and has helped many young people to become computer-literate.

In Search Of. . . . Craig Bergstrom, a ten-year-old, codesigned Snyder's latest game, *In Search of the Most Amazing Thing*. "Craig came to feel as though he was one of our regular programmers," Snyder notes. "He was working with pencil and paper, thinking out problems, rather than using the joystick to play games."

The new game starts off slowly in order to allow children to develop confidence in their ability to accomplish simple tasks using the computer. As the game progresses, the tasks get more and more complicated. The intrepid traveler learns decision-making, map-reading, music-writing, trading skills, and even how to fly a hot-air balloon. Much of the game involves dealing with aliens. Players learn to negotiate with the aliens rather than to destroy them.

In Search of the Most Amazing Thing was written and developed on the IBM Personal Computer, then translated to other computers. Snyder is so pleased with the way the project went that he has decided to use the pc for all his future software development.

Snyder is now busy working on an unusual computer game for children who have difficulty conceptualizing letters. In this game, the player must climb up the letters of a word the size of Mount Rushmore. The letters form a stone bridge across a valley. When the student gets to the other side, she must identify the word just crossed in order to be allowed to pass through a gate to the next word. Because the letters of the word are so big, the child can't see the entire word or even the entire letter she is in the process of climbing. Instead of learning by sight alone, the child learns the shapes of letters through the imaginary experience of crawling around on them; kinesthetic awareness enhances visual awareness. For kids who have difficulty seeing or decoding the letters, or who have a tendency to reverse them, this is a particularly valuable experience.

"A child who has been on top of a four-hundred-foot letter and has been able to slide down the slanted part of an R or climb on the inside of an H will have a real grasp of letters," declares Snyder.

Snyder recently collaborated on a book entitled *Practical Guide to Computers in Education*, published by Addison-Wesley. Although he enjoyed working on the book, the notion of putting novels on the computer is what really sparks his interest these days. Much of his program-writing could easily fall into this category. The programmer likes to describe himself as a software novelist, saying he borrows heavily from fiction-writing techniques in creating his software.

Snyder's vision of the future goes beyond the format of the novel to include short stories and stage plays on the computer. He feels that much of the important literature of the future will be accessible through computers and that ultimately software novelists will achieve the same prestige and public acclaim as mainstream authors.

When he thinks about the future, Snyder isn't the least bit worried that he will become a servant to the computer or cease to function as a teacher, just because the computer is used in the classroom. "I like to think of myself as an advocate for children and technology," he asserts. "Not the advocate of technology for children, but of the kids in relation to technology."

The shape of the future can be altered by the dreams of today. Powerful dreams yield powerful changes. Tom Snyder shares those dreams with the leaders of tomorrow, our children. ▲

tradetalk

Δ **IBM** (Boca Raton, FL) is offering Information Unlimited Software's *Easywriter* on the pc in Europe. The program has been specifically adapted to five European languages: British, French, German, Italian, and Spanish. Each version has undergone dual-level translations, first at **IUS** (Sausalito, CA), then through IBM translators in the targeted countries.

Δ **Microsoft** (Bellevue, WA) has appointed **Scott Oki** vice president of international operations. Oki will oversee the company's recently created subsidiaries in the United Kingdom and other European countries, as well as ASCII Microsoft in Japan—Japan's largest publisher of computer magazines. Formerly director of international operations, Oki also served with the Sequoia Group, a marketer of turnkey medical office computer systems.

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Δ A thirty-thousand-square-foot R&D lab and production line facility is the new home of **Microscience International** (Mountain View, CA). Address: 575 East Middlefield Road, Mountain View, CA 94043; (415) 961-2212. The company was formerly located in Palo Alto. Δ **Marsha F. Adams** has joined Microscience as director of marketing. Adams brings fifteen years of experience, having served as marketing consultant to a number of Bay Area companies, including Adda, Orrox, Transamerica, Via Video, Lucasfilm, and Syntex. At Strategic Inc. in San Jose, Adams coordinated technology impact analysis. She has also published articles and lectured on the subject.

Δ A $10-million line of credit has been extended to **Atasi** (San Jose, CA) by the Bank of the West. A spokesman for the bank said the firm "represents a well-positioned company in a growth sector of the computer industry. We were impressed by the strength and expertise of Atasi's management team as well as its achievements in product quality and performance." The funds will be used to meet the company's rapidly growing shipping rate of hard disk drives. Δ **Dr. Richard Oswald,** established industry consultant with more than twenty years' design experience, has been named vice president of technology at Atasi. "The addition of such a highly qualified individual is particularly exciting for a high-growth company like ours," says company president Frank Gibeau. Oswald spent eleven years at the IBM San Jose Development Laboratory involved with the IBM 3340, 3344, 3350, and 3370 disk files. He has also done consulting work in disk-file control systems and custom analog integrated circuits.

Δ **Alfred J. DiBlasi** has recently resigned as vice president of the programming division at **Berliner Computer Center** (New Hyde Park, NY) to do some consulting work, then settle down to his own retail computer center. A key person in the company's creation, DiBlasi, twenty-one, feels the computer field is still in its infancy, with plenty of room for new endeavors.

Δ **Robert B. McCullough** has left **Datamac** (Sunnyvale, CA) to pursue other interests. McCullough will continue to serve as chairman of the board and a board member, but will not be involved in day-to-day operations. The company wishes him the best.

Δ **State of the Art** (Costa Mesa, CA) has appointed **Dale Caravona** national sales manager. Caravona was formerly with Siemens, a manufacturer of electronic equipment, where he served as regional marketing and sales manager for two years. Prior to that, he served seven years with Abbott Laboratories. Δ **Jim Hennings** has been appointed director, professional markets, for State of the Art. Hennings will establish educational programs for sales representatives, retailers, and users. Prior to joining the company, Hennings was with Market Share, a sales-representative firm.

Δ A major media effort will be launched in the second half of this year by **Epyx/Automated Simulations** (Sunnyvale, CA), which has appointed **Chiat/Day** (New York, NY) as its new advertising agency. Spending during the next twelve months is expected to exceed one million dollars. Jay Chiat, president of the agency, says, "We are very pleased to have won as a new account such a well managed and dynamic company." The account will be handled from the San Francisco office. A combination of technical and consumer expertise will be applied to the Epyx campaign, accented with an entertainment viewpoint, according to the agency. Δ **Michael C. Katz**, former vice president of marketing and corporate communications at Coleco Industries, has been named president and chief officer at Epyx. Katz will oversee creation, marketing, and distribution of the company's games. He has held a variety of executive posts in consumer products marketing for the past fifteen years, including the last seven in the toy and electronic games industry at Mattel as well as Coleco.

Δ **Corona Data Systems** (Westlake Village, CA) has received $5.5 million in first-round venture capital from a venture capital group. The money will be used to retire current outstanding debt. Δ Also, the company has announced the election of two new members to its board of directors: **Leonard P. Lundin,** senior vice president of operations at Tandon; and **William P. Egan,** a partner in the firm Burr, Egan, Deleage, & Co. Lundin will contribute experience in low-cost-large-volume

production, and Egan will be of assistance in the financial area.

Δ **Compaq Computer** (Houston, TX) has elected **Benjamin M. Rosen,** a general partner of Sevin Rosen Partners, a venture capital firm, to chairman of the board. Rosen, a well-known electronics industry analyst and former publisher and author of the highly regarded *Rosen Electronics Letter*, has been a board member since the company's incorporation. Rod Canion, a cofounder of the company, serves as president and chief executive officer. Δ Joining Compaq as vice president of sales and service is **H. L. "Sparky" Sparks**, formerly director of retail sales for the pc at IBM. Sparks is a twenty-year veteran of IBM, and established and managed

sand; *Digital Retailing* reaches twenty-three thousand retailers, wholesalers, and suppliers.

Δ Expanding right along, **Source Telecomputing** (McLean, VA) has created a major new department to guide the development of the information and services it provides—specifically packaging and programming information. The new product development department will initially be staffed by seven people drawn from other departments, headed by **Barbara Newland**, former director of marketing. Prior to joining Source, Newland was a regional systems analyst and account executive for Xerox and a Peace Corps volunteer who taught English in Western Samoa. The others on her staff are: **Jeana Hood**, manager of product acquisition; **Pat Lobenstein, Julie Pek,** and **Beth Silverman**, new product managers; **Robin Cobbey**, manager of product research; and **Taylor Walsh**, manager of product standards. In a related assignment, **Jane Brown**, former manager of database acquisitions, has been named manager of business analysis.

Δ **Ziff-Davis Publishing** (New York, NY) is launching a new magazine this month, geared to the professional and advanced pc user. Under the helm of **Will Fastie,** formerly with *Creative Computing* and *PC*, *PC Tech Journal* will be a bimonthly publication dealing with operating systems, hardware components, software development tools, communications, networks, and so on. According to Fastie, the magazine will "appeal to professionals interested in the design and implementation of systems and others with a higher degree of technical experience."

Δ **MicroRIM** (Bellevue, WA) recently expanded into a new location. New corporate address: 1750 112th Avenue N.E., Bellevue, WA 98004.

Δ **Borman/Williams** (New York, NY) has been selected to handle product publicity and corporate public relations for **Software Arts** (Wellesley, MA). Miller Communications formerly handled the company's account, but a mutually agreed-upon parting was made when Miller acquired the Lotus Development account. Software Arts's *VisiCalc* and Lotus's *1-2-3* are vying head on for the lion's share of the spreadsheet market. Borman/Williams also handles Bose, an international audio products manufacturer, and Dusseldorf Trade Shows. ▲

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Δ **IBM** (Boca Raton, FL) is offering Information Unlimited Software's *Easywriter* on the pc in Europe. The program has been specifically adapted to five European languages: British, French, German, Italian, and Spanish. Each version has undergone dual-level translations, first at **IUS** (Sausalito, CA), then through IBM translators in the targeted countries.

Δ **Microsoft** (Bellevue, WA) has appointed **Scott Oki** vice president of international operations. Oki will oversee the company's recently created subsidiaries in the United Kingdom and other European countries, as well as ASCII Microsoft in Japan—Japan's largest publisher of computer magazines. Formerly director of international operations, Oki also served with the Sequoia Group, a marketer of turnkey medical office computer systems.

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Δ A thirty-thousand-square-foot R&D lab and production line facility is the new home of **Microscience International** (Mountain View, CA). Address: 575 East Middlefield Road, Mountain View, CA 94043; (415 961-2212. The company was formerly lo cated in Palo Alto. Δ **Marsha F. Adams** ha joined Microscience as director of market ing. Adams brings fifteen years of experi ence, having served as marketing consult ant to a number of Bay Area companies, in cluding Adda, Orrox, Transamerica, Vi Video, Lucasfilm, and Syntex. At Strategi Inc. in San Jose, Adams coordinated tech nology impact analysis. She has also pub lished articles and lectured on the subject.

Δ A $10-million line of credit has been ex tended to **Atasi** (San Jose, CA) by the Ban of the West. A spokesman for the bank sai the firm "represents a well-positioned com pany in a growth sector of the computer in dustry. We were impressed by the strengt and expertise of Atasi's management team a well as its achievements in product qualit and performance." The funds will be used t meet the company's rapidly growing ship ping rate of hard disk drives. Δ **Dr. Richar Oswald,** established industry consultar with more than twenty years' design exper ence, has been named vice president of tech nology at Atasi. "The addition of such highly qualified individual is particularly ex citing for a high-growth company like ours," says company president Frank Gibeau. Oswald spent eleven years at the IBM San Jose Development Laboratory involved with the IBM 3340, 3344, 3350, and 3370 disk files. He has also done consulting work in disk-file control systems and custom analog integrated circuits.

Δ **Alfred J. DiBlasi** has recently resigned as vice president of the programming division at **Berliner Computer Center** (New Hyde Park, NY) to do some consulting work, then settle down to his own retail computer center. A key person in the company's creation, DiBlasi, twenty-one, feels the computer field is still in its infancy, with plenty of room for new endeavors.

Δ **Robert B. McCullough** has left **Datamac** (Sunnyvale, CA) to pursue other interests. McCullough will continue to serve as chairman of the board and a board member, but will not be involved in day-to-day operations. The company wishes him the best.

Δ **State of the Art** (Costa Mesa, CA) has appointed **Dale Caravona** national sales man-

marketing and corporate communications at Coleco Industries, has been named president and chief officer at Epyx. Katz will oversee creation, marketing, and distribution of the company's games. He has held a variety of executive posts in consumer products marketing for the past fifteen years, including the last seven in the toy and electronic games industry at Mattel as well as Coleco.

Δ **Corona Data Systems** (Westlake Village, CA) has received $5.5 million in first-round venture capital from a venture capital group. The money will be used to retire current outstanding debt. Δ Also, the company has announced the election of two new members to its board of directors: **Leonard P. Lundin,** senior vice president of operations at Tandon; and **William P. Egan,** a partner in the firm Burr, Egan, Deleage, & Co. Lundin will contribute experience in low-cost-large-volume

production, and Egan will be of assistance in the financial area.

Δ **Compaq Computer** (Houston, TX) has elected **Benjamin M. Rosen,** a general partner of Sevin Rosen Partners, a venture capital firm, to chairman of the board. Rosen, a well-known electronics industry analyst and former publisher and author of the highly regarded *Rosen Electronics Letter*, has been a board member since the company's incorporation. Rod Canion, a cofounder of the company, serves as president and chief executive officer. Δ Joining Compaq as vice president of sales and service is **H. L. "Sparky" Sparks**, formerly director of retail sales for the pc at IBM. Sparks is a twenty-year veteran of IBM, and established and managed the pc's distribution channels and dealer network.

Δ Anticipating product demand, **Software Libraries** (Pasadena, CA) has moved into a new twelve-thousand-square-foot headquarters facility. The space will be shared with Exclamations, an affiliated greeting card publishing firm.

Δ **Lotus Development** (Cambridge, MA) has announced that **G. Mead Wyman** has joined the firm as vice president of finance and administration. Wyman was formerly with Prime Computer and brings extensive experience in the financial management of rapidly growing entrepreneurial companies to his position.

Δ **Newsweek** (New York, NY) and **Digital Retailing** magazine (New York, NY) have teamed up for a first: a *Personal Computer Guide* advertising supplement to appear in the October 31 issue of *Newsweek Executive Plus*, the company's special business edition, as well as the November issue of *Digital Retailing*, a trade magazine. The sixteen-page supplement will be an all-inclusive guide to selecting personal computers, complete with charts and comparisons. *Newsweek* has a circulation of nine hundred thousand; *Digital Retailing* reaches twenty-three thousand retailers, wholesalers, and suppliers.

Δ Expanding right along, **Source Telecomputing** (McLean, VA) has created a major new department to guide the development of the information and services it provides—specifically packaging and programming information. The new product development department will initially be staffed by seven people drawn from other departments, headed by **Barbara Newland**, former director of marketing. Prior to joining Source, Newland was a regional systems analyst and account executive for Xerox and a Peace Corps volunteer who taught English in Western Samoa. The others on her staff are: **Jeana Hood**, manager of product acquisition; **Pat Lobenstein, Julie Pek,** and **Beth Silverman**, new product managers; **Robin Cobbey**, manager of product research; and **Taylor Walsh**, manager of product standards. In a related assignment, **Jane Brown**, former manager of database acquisitions, has been named manager of business analysis.

Δ **Ziff-Davis Publishing** (New York, NY) is launching a new magazine this month, geared to the professional and advanced pc user. Under the helm of **Will Fastie,** formerly with *Creative Computing* and *PC*, *PC Tech Journal* will be a bimonthly publication dealing with operating systems, hardware components, software development tools, communications, networks, and so on. According to Fastie, the magazine will "appeal to professionals interested in the design and implementation of systems and others with a higher degree of technical experience."

Δ **MicroRIM** (Bellevue, WA) recently expanded into a new location. New corporate address: 1750 112th Avenue N.E., Bellevue, WA 98004.

Δ **Borman/Williams** (New York, NY) has been selected to handle product publicity and corporate public relations for **Software Arts** (Wellesley, MA). Miller Communications formerly handled the company's account, but a mutually agreed-upon parting was made when Miller acquired the Lotus Development account. Software Arts's *VisiCalc* and Lotus's *1-2-3* are vying head on for the lion's share of the spreadsheet market. Borman/Williams also handles Bose, an international audio products manufacturer, and Dusseldorf Trade Shows. ▲

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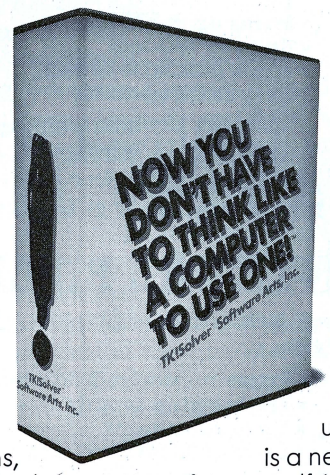

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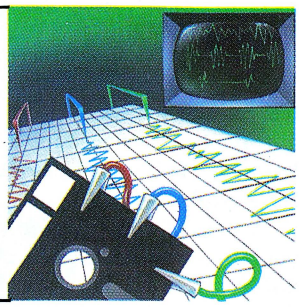

Unless otherwise indicated, software listed runs in DOS 1.1 or 2.0 with either display adapter and requires 64K and at least one disk drive.

Graph'n' Calc. By Don Williams/Marton. As its name implies, *Graph'n' Calc* is a graph and spreadsheet program. As its name also implies, graph is primary and spreadsheet is strictly secondary.

What its name doesn't hint at is the power in this business-forecasting tool. Author Don Williams has a modicum of expertise in the field. He spent several years with IBM and is the author of *Desktop Plan*. What he's done in *Graph'n' Calc* is take business forecasting into the visual medium. In so doing, he's overlaid the basic graphing and spreadsheet functions with sophisticated statistical modules that would take man-days for a user to build into *VisiCalc* or *1-2-3*.

In an era when more is better, Williams has taken the opposite approach. His spreadsheet is strictly limited to ten rows and one hundred columns. If that seems unnecessarily constraining at first glance, it actually works out to be more than enough space for serious forecasting purposes. *Graph'n' Calc* isn't intended to compete with the big guys in financial modeling. You can't enter your entire general ledger for the past umpty-ump years into the model and play "what if."

What you can do is take the key numbers out of that general ledger and actually watch while *Graph'n' Calc* first analyzes the trend of the numbers, then measures the correlation of the real numbers against adjusted numbers, extrapolates your numbers for future reporting periods, and, if necessary, adjusts those numbers for seasonal variations.

As an experiment, a set of real monthly sales numbers, omitting those for the most recent twelve months, was entered into *Graph'n' Calc*. The program was then asked to perform all its wonders and extrapolate the given data into the next twelve months. The results were eerily accurate, as if the software or the microprocessor were sneaking looks at the withheld data.

Graph'n' Calc determines these extensions of data with a series of sophisticated invokable statistical functions. Given a historical base, the program can find trends, apply them to the future, adjust the numbers for seasonal variations, and test the accuracy of the projections with exponential smoothing techniques.

That would be dandy enough in a spreadsheet program, but this one goes further by drawing it all out graphically. You can get line charts, bar graphs, stacked bar graphs, pie charts, and practically everything else except a Yogi Bear animated cartoon. The graphic features are smooth and easy to use and work readily with the IBM—read that Epson—printer or any compatible printer. The test data graphed just fine on a Star Micronics Gemini-10.

Printing the graphs gives a permanent hard-copy record of the progression of the model—showing which alternatives promise the most or what's in store for the next six months for various product lines.

Graph'n' Calc gives you even more. You can save each graph to disk—nineteen to a double-sided disk. Then you can set up a slide show, with the graphs flashing on-screen either at your command or at preset intervals during a presentation. This ability to prepare the data easily for visual presentation should make *Graph'n' Calc* a favorite among managers needing to sway their vice presidents and directors.

Desk Top Computer Software has gone the full route to give pc owners a usable product. They've even included *Fundamentals of Forecasting*, a book published by Reston Publishing Company, to give the beginner a sound foundation. Another nifty touch is the use of two monitors, if you're so equipped. The program requires a graphics adapter to display the graphs. If you also have a monochrome monitor installed, it'll leave the last graph on the graphics screen and put the text on the monochrome.

Graph'n' Calc is a dandy product that would be even dandier if it weren't so slow. It's written in Basic. There is a compiled version for an additional $100 that is faster, but much of the lost time is in disk access—an area not materially enhanced by compiling, although a hard disk would significantly speed up access time. On the other hand, the pc is a slow machine. If speed was the criterion for buying a system, you should have bought a Fortune or a Corvus.

By itself, *Graph'n' Calc* goes a long way toward reversing the trend of using the pc as merely an extension of the printed medium. It's a useful and friendly adjunct to any business or department and should find its niche. If it doesn't, author Williams will have to figure he's snakebit. First *VisiCalc* eclipsed *Desktop Plan*, now perhaps *1-2-3* will eclipse *Graph'n' Calc*. Both his products deserve better. art

Graph'n' Calc, by Don Williams/Marton, Desk Top Computer Software (Suite 29–303, 303 Potrero Street, Santa Cruz, CA 95060; 408-458-9095). Requires a graphics adapter. $199.

FriendlyWare P.C. Arcade. By Michael D. Yaw, James J. Davis, Alan Vanchura, Jr., R. B. Roberts, and Anthony Chumak. If you've ever wondered what the excitement's all about down at the pizza parlor where the kids hang out, here's your chance to get your feet wet without losing a week's pay in quarters and being humbled by eight-year-olds. This package of ten games, with good documentation as well as on-screen instructions, uses text-mode graphics. Not only will your monochrome monitor suffice, you can use your keyboard for controls, if for you playing with a joystick is about as likely as doing the hula at your neighbor's luau.

ASCII Man, sporting the traditional yellow garb (if you have a color monitor) and grin, has fairly offhand instructions that seem to assume you know the rules for the famous dot-eater game. If you don't, ask anyone about four feet tall.

Eagle Lander requires the dexterity of an octopus, the coordination of a Harlem Globetrotter, and the cool of an ice cream cone. If you resemble such a configuration, you just might land the space ship without smashing it to smithereens. Novice game players will find it easier to land a job.

Bug Blaster gives new meaning to the word sting; two bugs and a worm(!) will get you if you don't keep movin', shootin', and wipin' out the toadstools where the creepy-crawlies hide.

Gorilla Gorilla resurrects the famous twosome of King Kong and Fay Wray. The big ape bombs you with coconuts as you ladder-and-leap your way to the rescue, hopping bamboo elevators, and swinging your trusty coco-masher.

Star Fighter TX-16 is not for the person whose best reflex is triggered by a rubber hammer to the knee: The galaxy pirates will turn you to cosmic dust before you launch your first missile. This is a test for the ace space pilot.

Shooter is designed for the fortunate few whose stress level is too low. They're invited to shoot down fighter planes and dodge bombs for a while.

You say you stopped donating quarters to *Pong* machines when you discovered your houseplant has faster response time than you do? *Brick Breaker* lets you practice returning the old ball until you destroy a brick wall.

Hopper gives you five rabbits to get safely to five hutches on the other side of a road and a river with obstacles designed to turn bunnies into pancakes. A good game for beginners and philodendrons.

Robot War pits your robot against theirs in a maze-and-rays encounter. Your increasing skill is rewarded with mazier mazes where robots breed like steel rabbits.

PC Derby is the game for the person whose reaction time is bested by the backyard fence. This is strictly spectator stuff, with seven horses heading for the finish line. Add your own excitement with a little wager on the side. Better than watching goldfish.

The copy-protected disk (guaranteed free lifetime replacement) boots automatically; no need to use DOS or transfer system commands. A "boss-is-coming" function key that turns playtime into a bar graph, and twenty-four-hour phone support, suggest that FriendlySoft appreciates keeping a busy executive's aggravation to a minimum. JI

FriendlyWare P.C. Arcade, by Michael D. Yaw, James J. Davis, Alan Vanchura, Jr., R. B. Roberts, and Anthony Chumak, FriendlySoft (3609 Smith-Barry Road, Arlington, TX 76013; 817-277-9378). $49.95.

The Word Plus, Easyproof, and **Random House Proofreader.** Help is at hand for the multitudes once humiliated by eighth-grade spelling bees. Even those who stayed the rounds only to be defeated by *aardvark* will welcome the proliferating electronic spelling checkers. With varying success, they ensure two *ms* in *accommodate* and flag glaring typos (type *how* instead of *who* and the electronic dictionary can't help; it recognizes nonwords but not nonsense).

These three programs are compatible with a variety of word processors; all are preconfigured for *WordStar* and will fit on a double-sided disk with it. All were tested on a 64K system with two drives.

Using these programs is a simple matter of exiting from your word processor to DOS and issuing a two- or three-key command that initiates comparison of your document file to the program's dictionary, compilation of an unmatched-word list, and a correction procedure. Documentation ranges from excellent (*The Word Plus* includes a quick-reference guide) to adequate.

For comparison, each of the three programs was tested against the same nontechnical document file of approximately three thousand words, about fourteen double-spaced pages, containing four intentional typos: *progam, riters, produceds, WorldWar.*

All of the programs flagged several proper nouns that one wouldn't expect to find in dictionaries, although two of them recognized *Hoffman*. Some fairly common words went unrecognized by one program or another. None of these dictionaries included *cloned*, two didn't have *derivative, subsists,* or *archival*. And one or another didn't know *roams, safeguarded, misunderstanding,* or *transitory*. Fortunately, all three programs permit the addition of words to their dictionaries, so future usage won't be questioned. Each also permits you to create auxiliary dictionaries, an option especially

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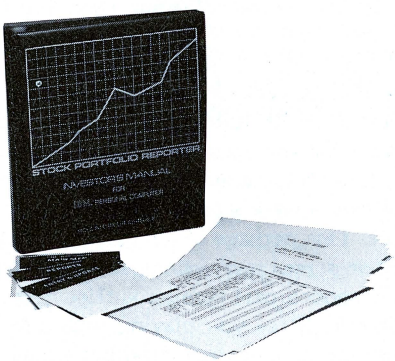

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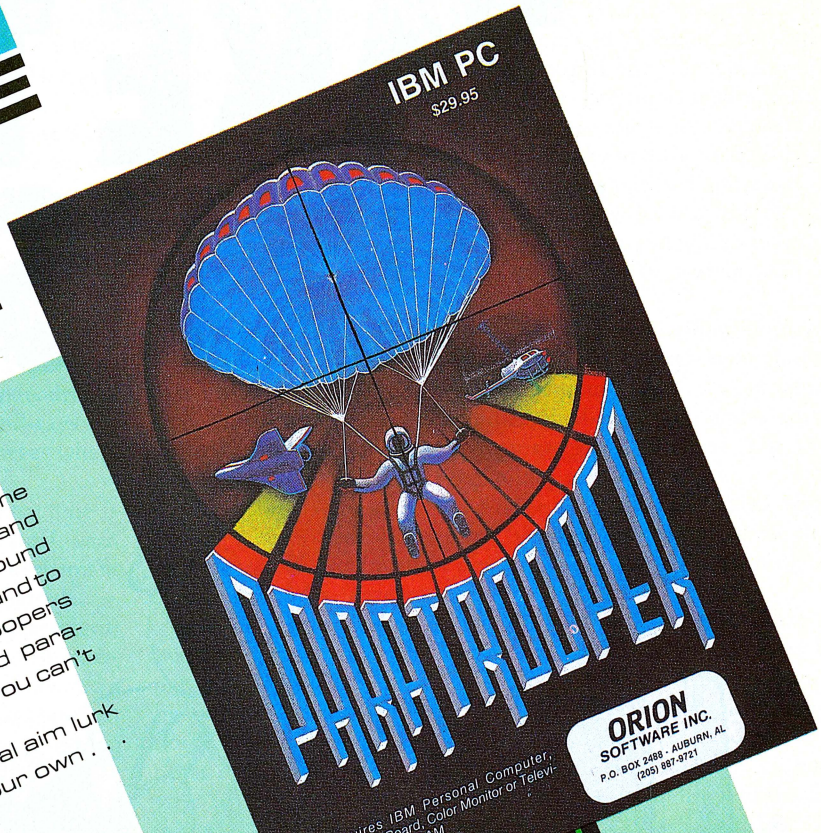

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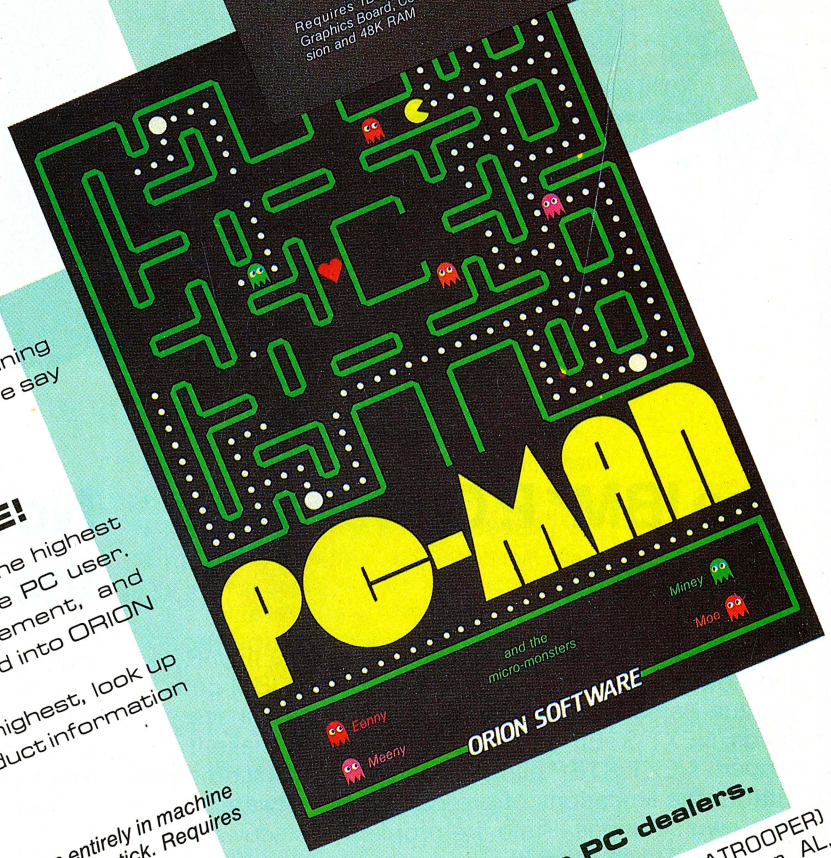

*Both PC-MAN and PARATROOPER are written entirely in machine language and can be played with a keyboard or joystick. Requires color graphics adaptor, 48 K RAM.

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useful for technical documents.

The Word Plus took sixty-five seconds to compare the test file to its forty-five-thousand-word dictionary, and another twenty-five seconds to compile an alphabetical list of thirty-eight unmatched words. Its on-screen menu permits viewing each word in context; you can then correct it, add it to the dictionary, mark it in the file, or discard (ignore) it. An automatic correction procedure took thirty-five seconds to correct the four implanted typos and mark three of them (an optional procedure). The marking symbol lets you use your word processor's search mode to locate corrected words that, because of changed length, necessitate line rejustification or paragraph reforming.

The Word Plus displays its word list in caps, and its correction procedure does not recognize capitalization. A correction of the typo *WorldWar* produced *World war* in the test document; the upper-case *W* was input but ignored, a failing that flaws an otherwise excellent program. Oasis reports that it has developed a different program for correcting style and punctuation, including capitalization.

Nevertheless, *The Word Plus* is rich with options, some useful, others merely curious. *Lookup* shows you similar words from which you may select the correct spelling. For the intentional typo *produceds*, *Lookup* displayed three similar words—*produced*, *producers*, and *produces*—in fourteen seconds. For *riters*, a typo created by a lost initial *w*, *Lookup* offered, in ten seconds, *riders*, *rioters*, *rites*, and *rivers*. Obviously, first letters must be correct or this option is useless. Interestingly, although *copyright* was recognized by the dictionary, the program flagged *copyrighted* and claimed it had no similar word.

If your printer doesn't do proportional spacing, use *Hyphen* to insert soft hyphens into a document to tighten justified lines, an option especially useful for narrow-column formats. *Find* helps solve or create crossword puzzles through global searches. Need a five-letter word starting with *T*? Just type *find T*****. This option lets you peek into the dictionary. Type **A*** and the dictionary's entire *A* listing scrolls. It reveals some interesting words, including *Apalachicola* and *Azerbaijan*—the former a river in northwestern Florida and the latter a constituent republic of the USSR. Oasis claims, "Our dictionary includes the words that people really use." Who do they know that you don't?

Playing around with *Find* reveals a number of proper names in the dictionary, among them: *Ragna, Maura, Samar, Maira, Laban.* The people at Oasis really do know people you don't.

WC is simply a word count. The test document totaled 3,146 words courtesy of this option. *Homonym Help* is for those folks who get sound-alike words confused. *HH* won't tell you which word you want if you don't know the difference between *capital* and *capitol*, but it reminds you of the alternative. This option goes to great lengths to be helpful. The list, to which you can add your own tripper-uppers, includes *celery/salary* for those who confuse their salads with their paychecks.

Dictsort alphabetizes any word list you want to give it, and *Wordfreq* reveals how often you're using words. The test document, for example, had *the* 173 times, *program* 63 times, *programs* 14 times, and *programmers* 3 times. You have to figure out for yourself what use you have for such information.

Easyproof counts words simultaneously while checking your document against the fifty-thousand-word dictionary but is otherwise strictly no-frills. Unlike *The Word Plus* and *Proofreader*, it does not correct errors; it only marks them. You have to go into the document through your word processing program and make the corrections yourself.

Easyproof tallied only twenty-four unmatched words in the fifty-four seconds it took to compare the test document against its

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dictionary. Although it found several words the other programs didn't, and caught the intentional typos *progam* and *WorldWar* (which it displayed in upper and lower case), it missed *produceds* and *riters*. It failed on these two errors because *Easyproof* recognizes common prefixes and suffixes and happily appends them to any word you like. If you want to add an *r* to *rite* under the same principle that turns *ride* into *rider*, do it; this program won't object. Likewise, any word can have a plural form; *Easyproof* doesn't mind if you add an *s* to *produced*. Norell admits this limitation but offers no solution.

Easyproof does not provide an on-screen menu for your list of unmatched words, but you have only four choices: *i*(gnore), *m*(ark), *a*(dd), and *r*(oot). You would ignore a word, like a proper noun, that you wouldn't likely use often, or mark an error for later correction. You can add to the dictionary a correctly spelled word you expect to use frequently, or a root word like *store*, which would cause *Easyproof* to recognize such derivations as *restore*, *storing*, *stores*, and so forth.

Easyproof's options do not extend much beyond saving your list of misspelled words on disk, using one of the various "switches."

Like *Easyproof*, the **Random House Proofreader** automatically gives you a word count; it then sorts your document's words. The program took twenty-five seconds to count the test document's words and another twenty seconds to sort them. So far so good. The next two minutes and seven seconds were spent watching the letters of the alphabet disappear one at a time as the fifty-thousand-word dictionary read the word list against itself. (Smaller and larger lexicons are available, dependent on machine capacity.) After finally achieving Z, *Proofreader* announced it had failed to match forty words in the test document.

A command menu permits correction (automatically showing the word in context, a nice feature), review (for rechecking, with no context display), marking, or display of word list. *Review* is a handy and timesaving option. You can quickly dismiss from the list those words that you know to be correctly spelled and that you won't want to add to the dictionary.

The correction routine allows you to correct the word, ask for dictionary assistance, add the word to the dictionary, or accept the word without adding it to the main or auxiliary dictionaries. This last option is unusual; it permits you to acknowledge the word's correctness and thereby avoid reviewing its subsequent appearance in your document, but not add it to the dictionary. Also, the *Proofreader* dictionary will "learn" words during the correction procedure, a variation on the *accept* mode. After your document is corrected, "learned" words can be added to the dictionary or placed in a separate file.

Proofreader flagged the four implanted errors and took less than a minute to correct them. However, all four occurred in the first two pages of the fourteen-page document, and the program, which does not abandon a file after correcting marked words, required another minute to complete the file search.

Despite its relatively slow performance, this program does nicely everything you'd expect a dictionary to, including capitalization correction. Its menus are helpful and well designed. Not the least of its attractive features is its price.

Incidentally, only one of these programs recognized *aardvark*—the same folks, not surprisingly, who bring you *Apalachicola*. JI

The Word Plus, Oasis Systems (2765 Reynard Way, San Diego, CA 92103; 619-291-9489). $150.
Easyproof, Norell Data Systems Corporation (3400 Wilshire Boulevard, Box 70127, Los Angeles, CA 90010; 213-257-2026). $49.95.
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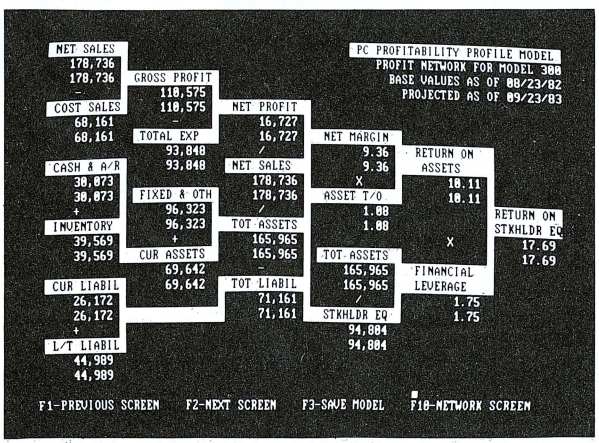

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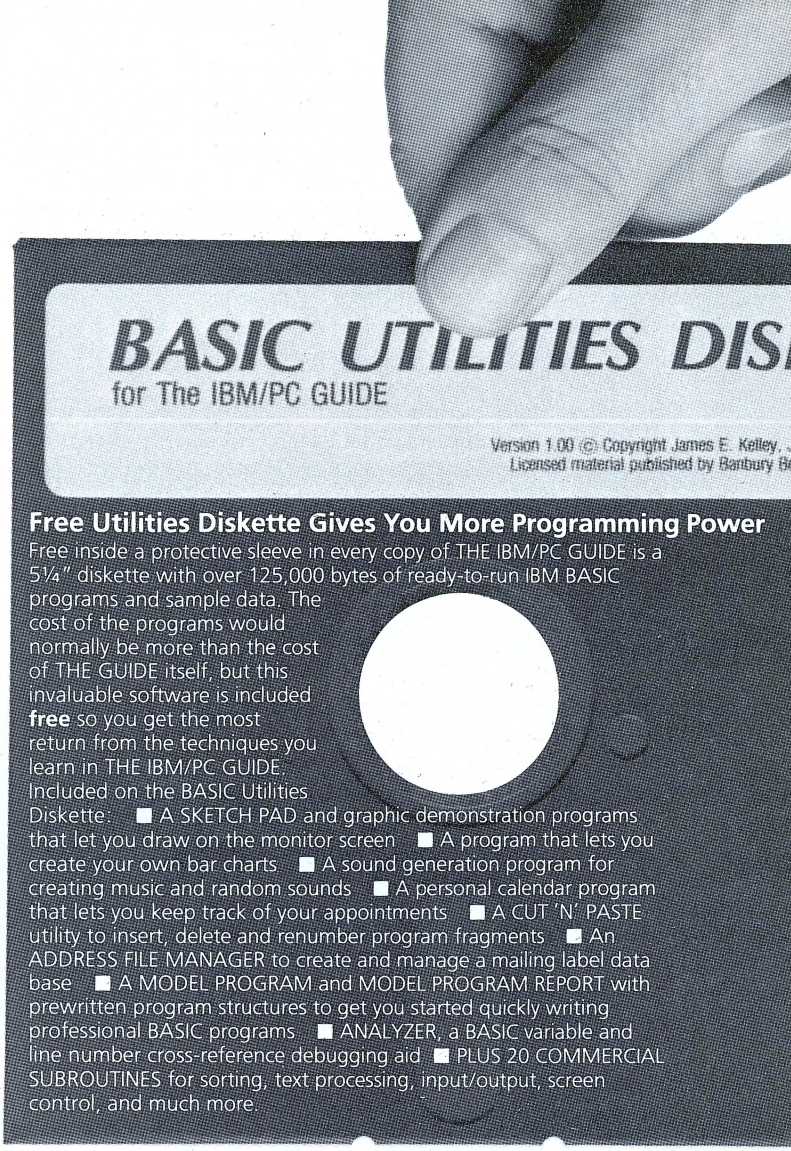

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As a tax planner, *Plan 1040* is pretty nifty—not as nifty as a comparable one from Aardvark, but then the price tag, at $150, isn't as hefty either.

But as a piece of programming art, *Plan 1040* is rivaled so far only by *1-2-3*.

The program is being brought to the pc after development on some of IBM's minicomputers. That doesn't necessarily explain its potency, because it's written in 8088 machine code, which is not your standard minicomputer programming environment. But it probably explains the commitment to performance that permeates the entire package.

Software 1040, which publishes the program, had an easier task than some other publishers had. The firm was able to assume that it would be selling to pc owners knowledgeable in both taxes and in the operation of their pcs. That meant they didn't need to write a bunch of code to make screens pretty. It also allowed the company to make better use of the pc keyboard than most other packages extant.

The result is a superior piece of software that authors at home in the microcomputer world could learn from. A minor example is its handling of print output. No long screens of output configurations here. The authors know what their program does, so they've configured it themselves, using both normal and extended typefaces. Likewise, their consideration of the user. How many times have you had to reset your printer for top of form because the last program you used just stopped wherever the page ended? This isn't a problem with *Plan 1040*. It sends a form feed to get your printer ready for the next output. That reflects the minicomputer background, where print requests are often queued up, with the requester dependent on the prior users to have advanced the paper to top of form. A small thing, but a lesson micro authors could well learn.

If *Plan 1040* sets a performance standard, pc owners will have much to look forward to.

Plan 1040 is set for 1983. Tax professionals and the tax-knowledgeable will find it a speedy and useful adjunct in preparing for next April 15. art

Plan 1040, Software 1040 (10 Nevada Drive, Box 1010, New Hyde Park, NY 11042; 516-775-5566). $150.

PCcrayon. By Al McFarland and Joe Juhasz. This well designed program can draw and store virtually any graphic shape or character font. Arcs, circles, straight lines, or dots are easily combined with keyboard-entered text or specially created characters to form a seemingly endless variety of graphic images.

PCcrayon creates and stores five types of screen images: drawings, graphic symbols, vector symbols, keyboard text, and scenarios—combinations of images that can be several screens in length. When replayed, a scenario is similar to a slide show. Colors are available within the limits of BasicA, including control of foreground, background, and area painting.

You can draw lines, arcs, circles, and dots in nine widths. Single-key control with the cursor keys moves a + symbol in any of eight directions, and a toggled "worm" mode causes the cursor to draw as it moves. The cursor's coordinates are displayed at the lower left of the screen, and the cursor moves in any increment—usually one or ten dots per keystroke—when the insert key is toggled.

Drawings are entire screen contents stored on disk in *xxx.drw* files, each consuming over 16K because the full contents of the color graphics/adapter card memory are saved.

Graphic symbols generally are small pictures or symbols drawn on specified portions of the screen. You designate upper-left and lower-right corners of the symbol to be saved, and the resulting image is added to the currently open *xxx.gsm* file. You can create several of these files, each containing up to twenty symbols.

Vector symbols—line drawings that can be displayed with variable angles, sizes, or colors—are used primarily to create character fonts or graphic symbols requiring rotation and scaling. The vector creation mode displays a forty-by-forty dot matrix on which you define a unique character by connecting any sequence of points. Vector symbols are stored in the currently open *xxx.vsm* file, which can contain any number of images, limited only by disk capacity.

You create graphic and vector symbols with eighteen single-key commands; an additional eighteen commands, preceded by "Z", provide housekeeping functions.

You can animate sequences of previously created symbols (graphics or vectors) by *floating* them between any two points on-screen, at a choice of nine speeds. A status display reminds you of the cursor drawing increment, line width, background or foreground colors, or worm mode on/off.

PCcrayon's text mode enters text strings from the keyboard to the screen, locates them anywhere in the display area, plus moves, copies, and changes colors. There are two text styles: *standard* uses the ROM character set; *vector* uses a vector symbol file. Vector text strings can be scaled and rotated; standard text strings cannot. Both styles can be combined with symbols to form more complex symbols, drawings, or scenarios.

A scenario can be created from almost any sequence of *PCcrayon*'s commands, including recall of graphic and vector symbols from disk, animation of symbols or text on the screen, and changes in color, size, or rotation. A capture file (*xxx.cap*), created by recording the sequence of keystrokes, stores even long and complex scenarios compactly. The demonstration scenario on the *PCcrayon* disk runs

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approximately three minutes and twenty seconds and uses only 9.9K of disk space. Twenty-six of the single-key and Z commands can be captured to create a scenario.

The scenario mode, interestingly, simulates the principles of the Canadian Telidon videotex system. A videotex system is a public or private database network providing graphics-oriented information via telephone systems, to subscribers with specially modified TV sets. A decoder card in the modified TV interprets codes representing arcs, lines, points, rectangles, and polygons, along with display coordinates, colors, rotation, scaling, and so forth.

Both *PCcrayon*'s scenario mode and the Telidon system interpret codes to create graphics displays. The difference is that Telidon uses hardware, while *PCcrayon* uses a Basic program called *pcreplay.bas*. Although *PCcrayon* does not have a built-in communications function like the Telidon decoders, it could be modified to allow periodic reading of asynchronous communications input and subsequent display of one or more scenarios. Conceivably, *PCcrayon* could be a "poor man's" videotex system.

Three other files, *gsym.usr*, *vsym.usr*, and *replay.usr*, contain instructions and routines for interfacing Basic programs to graphic symbol, vector symbol, and scenario replay files. This capability could interface analytical or computational routines in Basic to corresponding graphic images in an *xxx.gsm* file, which would permit computer-aided instruction (CAI) and computer-aided design (CAD). This would also be an alternative to interfacing communications to *PCcrayon* to transmit graphics.

A recent enhancement allows *PCcrayon* to use electronic disk utilities—up to four drives—for both program and data files, a welcome addition, since disk accesses can become bothersome during intensive graphic design work. An anticipated business-graphics utility will allow creation of pie, bar, and line charts, which would make *PCcrayon* the equal of some standalone business graphics packages. Interfacing such utility software as print spoolers would add even more versatility, by reducing the eight-minute print cycles for screen-graphics dumps.

PCcrayon gets high marks for user-friendliness, with good use of prompts and effective error-trapping. However, it has its share of minor faults, including a tendency for the keyboard buffer to overload when you try to move the cursor rapidly from point to point. A solution would be to interface other input devices to *PCcrayon*; light pens, graphic tablets, and joysticks would undoubtedly improve drawing performance. The drawing of arcs is somewhat difficult; there is no visual reference for selecting the three required points, but this could be improved by a display of dots as each point is entered. As mentioned, eight minutes are required to dump a graphics drawing, which hampers production of large quantities of illustrations. *PCcrayon* works adequately on a good composite monitor or TV, but an RGB monitor greatly improves color and definition, particularly on detailed symbols.

The program works well with DOS 2.0, and the new DOS utility, *graphics.com*, allows direct screen printing of dot graphics to the Epson MX-80 printer equipped with Graftrax. With this utility, which should not be too difficult to interface, a drawing that takes eight minutes to print with *PCcrayon*'s Z-Print command will print in about a minute and a half. Also, the *graphics.com* program aligns drawings with normal paper orientation, a big help for book illustrations. The QuadBoard electronic disk program, *qd.exe*, works with DOS 2.0 and can be used with *PCcrayon* for file storage.

PCcrayon is a versatile, comprehensive, and flexible graphics application package, and more than reasonably priced. bc

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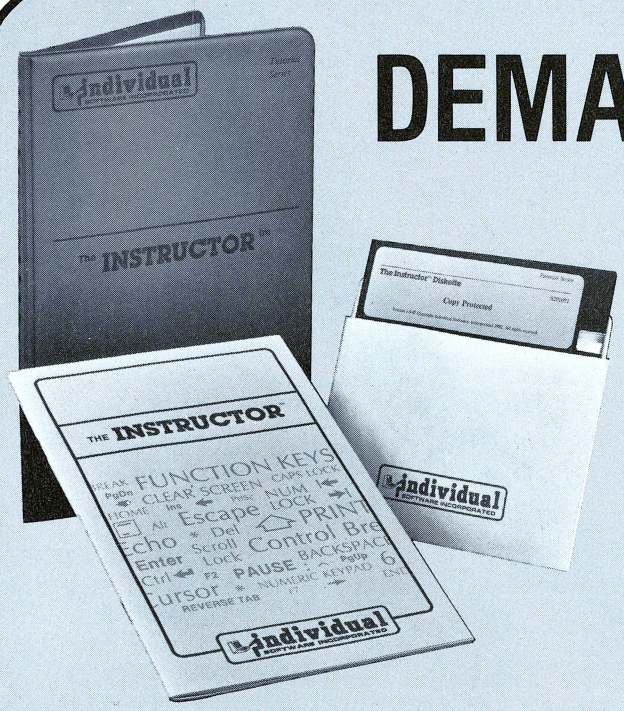

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PASCAL

E·X·T·E·N·D·E·D

Part Two of Three Parts · by Dara Pearlman

If you've learned another computer language before Pascal, you've probably noticed that Standard Pascal has certain drawbacks. Particularly striking are its primitive string-handling abilities, its limited input-output statements, and its inability to peek into specific memory locations.

To compensate, most Pascal compilers now include extensions, making the language both more powerful and easier to use. *Super arrays*, for example, give greater control over memory allocation. *Address pointers* allow you to peek and poke, Basic style, into internal memory.

Recycling Memory Resources. Pascal's advantage for small computers is its ability to allocate memory dynamically. When you compile your program, you don't need to reserve an area of computer memory for your data. When you run the program, Pascal allocates the memory necessary to store data and will free the memory when you no longer need it.

Pascal procedures *new* and *dispose* reserve and free memory from a Pascal memory pool called the *heap*. In this process, pointers connect the heap variables to each other, which is handy for linked lists and data trees.

But Standard Pascal is at a loss if you want to use heap memory for a simple array. In this case, you must declare your array size in advance in a statement such as

```
VAR NUMBER_TABLE: ARRAY [1..10] OF
INTEGER;
```

You can't adjust the size of the array at run time.

However, that limitation disappears with IBM Pascal's *super array*. You can use heap memory for arrays and wait until run time to decide array size. Figure 1 on the next page shows how.

First, though, let's look at the data structures. The *type* declaration is

```
INTEGER_ARRAY = SUPER ARRAY [1..*] OF
INTEGER;
```

The asterisk represents the upper bound of the *super array*, which remains undeclared until run time. The only size limit is that the array cannot be larger than 32,766 (*maxint*−1) bytes.

Then we declare a pointer to the *super array*:

```
VAR INPUT_ARRAY:  ^INTEGER_ARRAY;
```

This is how Standard Pascal usually establishes a pointer variable. To refer to the actual contents of *input array*, we use the pointer referent form of the variable, with the caret "^" coming after the

variable name: *input array*∧.

Using figure 2, we're ready to walk through the executable part of the program. Where the program asks for the number of integers in the table, we type 6. The program uses this *array limit* to allocate the correct amount of heap memory in the statement

NEW (INPUT_ARRAY, ARRAY_LIMIT);

To check and see what happened, IBM Pascal's predeclared *sizeof* function will give the array size in bytes (in this case, 12), and the *upper* function will give the upper limit of the array (6). Don't use these functions on a heap array that hasn't been allocated or has already been returned to the heap. Your program will crash.

Now we enter the values into the table. To refer to each element in the array, we use pointer referent notation with the index I: *input_array*∧*[I]*. We examine the contents of the array by writing the numbers back out to the screen, and then we return the array storage area back to the heap with

DISPOSE (INPUT_ARRAY);

You wouldn't use this complex technique for such a small array, but it helps use available memory to best advantage when you're working with several very large arrays.

It could come in handy also when you're working with the special IBM Pascal types derived from *super arrays*, the *string* and the *lstring* discussed last month. We postponed details of the pointer referent *string* and *lstring*, but having introduced the *super array*, let's discuss them now.

Pointer on a String. The formal definition of *string* is

TYPE STRING = SUPER PACKED ARRAY [1..*]
OF CHAR;

and the formal definition of the variable length *lstring* is

TYPE LSTRING = SUPER PACKED ARRAY [0..*]
OF CHAR;

```
PROGRAM SUPER_ARRAY (INPUT, OUTPUT);

TYPE
        INTEGER_ARRAY=      SUPER ARRAY [1..*] OF
                            INTEGER;

VAR
        INPUT_ARRAY:        ∧ INTEGER_ARRAY;

        ARRAY_LIMIT,
        I:                  INTEGER;

BEGIN (*PROGRAM SUPER_ARRAY *)
        WRITE ('Enter number of integers in array..');
        READLN (ARRAY_LIMIT);

        (* Allocate memory to array *)
        NEW (INPUT_ARRAY, ARRAY_LIMIT);

        WRITELN ('Size of input array in bytes is ',
                 SIZEOF (INPUT_ARRAY∧,
                 ARRAY_LIMIT));
        WRITELN ('Upper limit of array is ',
                 UPPER (INPUT_ARRAY∧));
        WRITELN ('Please enter an integer after ''?''
                 prompt.');
        (* INPUT LOOP *)
        FOR I := 1 TO ARRAY_LIMIT DO
                BEGIN
                WRITE ('?');
                READLN (INPUT_ARRAY∧[I])
                END;

        WRITELN ('Values in array are:');
        (*Output Loop*)
        FOR I := 1 TO ARRAY_LIMIT DO
                WRITELN (INPUT_ARRAY∧[I]);

        (*Free memory allocated for array*)
        DISPOSE (INPUT_ARRAY);

END.    (*PROGRAM SUPER_ARRAY*)
```

Figure 1.

```
Enter number of integers in array..6
Size of input array in bytes is      12
Upper limit of array is      6
Please enter an integer after ''?'' prompt.
?45
?33
?46
?78
?9
?22
Values in array are
        45
        33
        46
        78
         9
        22
```

Figure 2.

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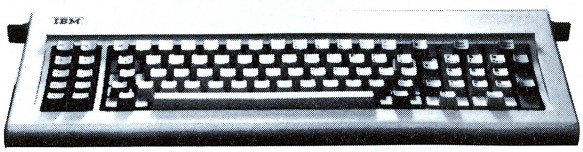

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For the *string*, the usual *super array* size limit applies; it can be no longer than 32,766 bytes. The *lstring*, which stores length information in the first byte of the array, can be no longer than 255 bytes.

Since the two string types are special cases of the *super array*, we can use the same technique to dynamically allocate memory for a *string* or *lstring* from the heap. Suppose, for example, we wanted to wait until run time before declaring storage of a *string* called *name*. Normally, we would define the maximum length for *name* in a statement like

VAR NAME: STRING(20);

where the maximum length is 20. Instead, we can define *name* as a pointer to the type *string*:

VAR NAME: ∧STRING;

Suppose we read the length we need into the variable *length*. We can then create storage for *name* from the heap with

NEW (NAME, LENGTH);

just as we did with the integer *super array*. And as with the regular *super array*, we must refer to the contents of the variable *name* with the pointer referent notation *name*∧. Finally, when we're done with *name*, we can free the storage using

DISPOSE (NAME);

The Right Address. IBM Pascal also uses pointers to locate specific memory addresses, similar to Basic's *peek* and *poke*. But before seeing how, let's take a look at the way IBM Pascal classifies numbers and builds memory addresses.

In addition to the Standard Pascal numerical types of *integer* and *real*, IBM Pascal uses the numerical type *word* for handling memory addresses. A *word* is a positive whole number between 0 and 65,535. The upper limit, which has the predeclared name *maxword*, could also be referred to as "64K −1" or "2^{16} −1." With that range, a *word* variable can fit into two bytes of memory, a size often called a "word."

You can use a *word* in much the same way you use an *integer*, either in arithmetic or as the index of an array. Although you can't mix *integers* and *words* in the same statement, IBM Pascal has functions for converting an *integer* to a *word* and vice versa. The function *wrd* will change any ordinal type, including a character, to a *word*. For example:

WORD_TEN := WRD (INTEGER_TEN);

The function *ord* will change it back again, as in:

INTEGER_TEN := ORD (WORD_TEN);

Word has a subtype called *byte*, which, not surprisingly, is one byte long and has a value range from 0 to 255. You can use it in arithmetic together with *words*, and with IBM Pascal address pointers to talk to the operating system.

The sixteen-bit size of the *word* is ideal for IBM pc memory addresses, because the internal registers of the pc's main processor are sixteen bits, or one word, long. Each byte of memory has a unique location number, or address, and the pc uses registers to specify the next address it wants. Thus, if your pc has 128K of internal memory, then the memory location numbers begin at 0 and go up to 131,071 (2^{17} −1).

If you wonder how a sixteen-bit register, which can hold a quantity up to 65,535, can find addresses like 131,071, the answer is offset addressing, a technique that uses two sixteen-bit words to form an address. The first word holds the address of a segment, a section of 64K of memory. When the pc's main processor encounters a segment address, it multiplies the address by sixteen to get the true address value. The second word holds the offset address, which, when added to the true segment address, gives the desired memory location.

An analogy to decimal numbers might make this idea clearer. Suppose you needed to count to 9,999 but could only write three digits. You could use one three-digit number, say 257, as the first portion of your number, deciding that the real meaning of 257 would be 257 multiplied by 10, or 2,570. A second three-digit number, say 743, would be the offset portion of your number. Add 743 to the segment value 257 (which really means 2,570), and you get 3,313, a four-digit number represented by two three-digit numbers.

In assembly language, you can usually abbreviate your addresses. The main processor keeps the address of an area of memory, called the current data segment, in a special register. For information in the data segment, this address acts like the phone company's area codes. Referring to an address within the data segment is like making a local call; you don't need to specify the segment address.

Conventional shorthand for memory addresses is SSSS:RRRR, where S represents the segment portion of the address, and R represents the relative, or offset, portion. Both portions are in hexadecimal notation. An example would be 0040:0050, which is the memory location where the cursor position is stored. (More about that in a moment.)

Proper Forms of Address. Now let's look at IBM Pascal address pointers. There are two types: relative machine address, called *adr*, and segmented machine address, called *ads*.

An *adr* address corresponds to the sixteen-bit offset portion of the pc's addressing scheme, the local telephone number in our analogy. If you're unfamiliar with the assembly language for the pc's Intel 8088 microprocessor, you might not know whether you need the segment portion of the address, the "area code," as well. A good rule of thumb is that when the address refers to data in your program, use *adr*. When the address refers to an area outside your program, such as the DOS data area, use *ads*.

Ads is two *words* long and includes both the segment portion and the offset portion of an address. You can refer to the segment

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portion alone by using Pascal record notation and adding the suffix .S to your *ads* variable name. You can refer to the offset, or relative, portion by adding the suffix .R to the variable name.

For example, to refer to the beginning address of the memory on the color/graphics monitor adapter, we would use the *ads* form because the 16K of memory on the adapter would not normally be part of our program. We could define the address variable as

VAR SCREEN: ADS OF WORD;

Then we could load the correct address into *screen*, using the assignment statements:

SCREEN.S := 16#B800;
SCREEN.R := 16#0;

The 16# notation means that the following number is in hexadecimal form. The first assignment statement places the hexadecimal value B800 into the segment portion of the address variable *screen*. The pc's processor will understand that number to be shorthand for B8000, or 753,664 in decimal. The second assignment statement puts 0 into *screen*'s relative address portion, because we don't want any further offset; B8000 is the address we want.

To look at the *contents* of the *word* at location B8000, we use the pointer referent variation of the variable *screen*, as in:

WORD_VARIABLE := SCREEN∧;

For an example of the practical use of address variables, see figure 3, a program with two routines for designing video screens. *Locate*, like IBM Basic's statement of the same name, places the cursor at the row and column coordinates you specify. *Clear*, as you'd expect, clears the screen.

Let's look first at *locate*. We define *col_position* and *row_position* as variables of type *ads*. There's a special memory area that holds cursor information. Page A-3 of the IBM *Technical Reference* manual defines the area in assembly language. The row cursor position is stored in a byte of memory at address 0040:0050. The next byte, at address 0040:0051, holds the column cursor position.

To communicate with this operating system area, which is outside our program, we use *ads*. Note that we define the variables as *static*. This IBM Pascal attribute designation gives a local variable a fixed location in memory, as if it were a global variable. To avoid cluttering up the executable code with assignment statements, we use another IBM Pascal feature, the *value* section, to initialize the variable. In this case we use the *value* section to load the addresses into our *ads* variables.

Now composed of only two statements, the executable portion is simplicity itself:

ROW_POSITION∧:= CHR (ROW −1);
COL_POSITION∧:= CHR (COL −1);

We use the *chr* function because the operating system needs the cursor position in binary rather than integer form. We subtract one from the incoming row parameter because DOS sees the screen coordinates as starting at (0,0) in the upper-left corner and ending at (24,79) in the lower-right corner.

As mentioned, Pascal's *locate* uses the same conventions as Basic's procedure of the same name. If you prefer a different form, such as the Cartesian coordinates (x,y), you can simply reverse the parameters in the procedure declaration, placing *col* before *row*.

Array Addresses. The *clear* procedure illustrates additional techniques for using address pointers. To combine address pointers with arrays, for example, we use the IBM Pascal address subtype *adsmem*. It is the segmented address of an array, defined as:

ADSMEM = ADS OF ARRAY [0..32765] OF BYTE;

It has a cousin in relative address form, defined as:

ADRMEM = ADR OF ARRAY [0..32765] OF BYTE;

These forms allow us to use pointer referent array notation to specify the addresses of individual bytes in the array, as with *super array*. For example, we can define a variable such as:

VAR SCREEN: ADSMEM;

After we assign an address to *screen*, we can move a value into the second byte of the array with the statement

SCREEN∧[1] := 32;

IBM Pascal uses *adsmem* and *adrmem* in parameter definitions for several built-in routines using address variables. This gives the routines added flexibility, because they can accept any address type as actual parameters. That is, when you see *adrmem* in a parameter definition, you can send the routine an *adr* type instead. All relative address types are compatible with each other, as are all segmented address types. But don't mix a segmented type with a relative type.

Video Adapter Memory. Now let's use this idea in the *clear* procedure, which relies on the pc's memory-mapped video feature. That means that the pc can treat the memory on your video adapter card as if it were ordinary read/write memory. This memory, which is 4K on the monochrome display adapter and 16K on the color/graphics adapter, is the reservoir of information for the display screen. The electron beam that scans the screen many times each second transfers the information from the video adapter memory to your screen. If you change the contents of that memory, you change the screen.

The memory, or buffer, on the monochrome display adapter begins at location B000:0000. On the color/graphics adapter it begins at B800:0000. The color/graphics adapter can store up to four screens of text information, but we have designed *clear* to work only with the first screen. Thus we define the *crt_buffer* to be 4K (4,096 bytes) long, which will work equally well with both adapters.

We define a *crt_buffer* type as

TYPE CRT_BUFFER = ARRAY[0..CRT_BUFFER_SIZE −1] OF CHAR;

and then use that to define the variable *screen*:

VAR SCREEN: ADS OF CRT_BUFFER;

This makes *screen* similar to an *adsmem* variable, except that it is 4K

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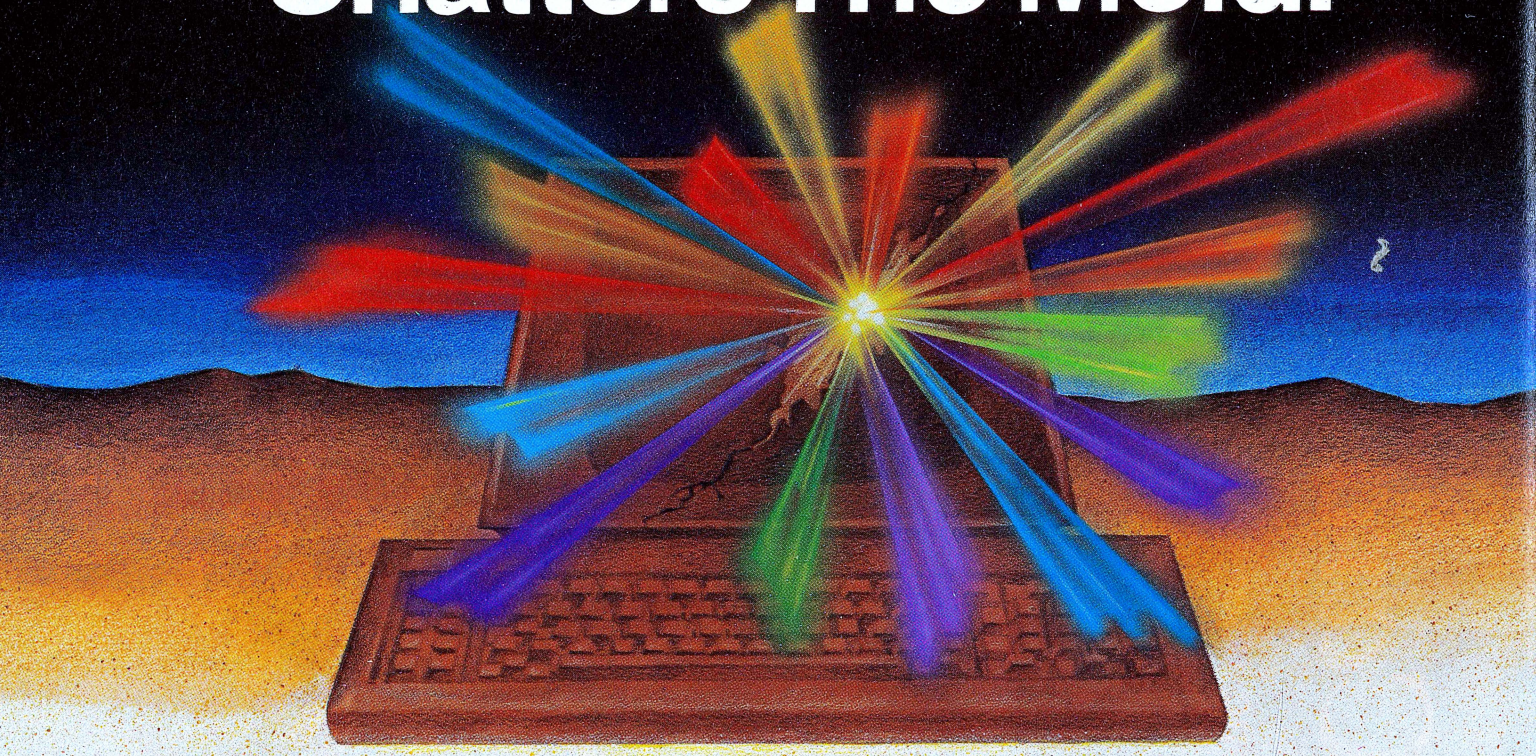

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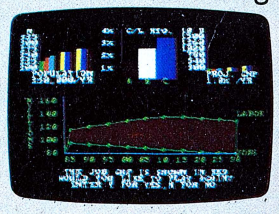

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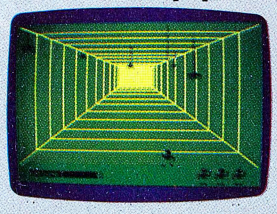

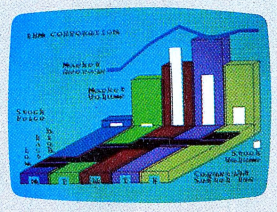

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```
Program VIDEO (Input,Output);
        (* This program illustrates the use of utility
           procedures LOCATE and CLEAR. The main
           routine clears the screen, moves the cursor to home
           (1,1) position, and then writes an 'X' at the
           coordinates requested by the operator.*)
VAR
        MAIN_COL,
        MAIN_ROW: INTEGER;
PROCEDURE LOCATE (ROW,COL: INTEGER);
        (* Places cursor at indicated column and row. Upper
           left is (1,1); lower right is (25,80) *)
TYPE
        COORDINATE=    CHAR;
VAR     [STATIC]
        COL_POSITION,
        ROW_POSITION:  ADS OF COORDINATE;
VALUE
        COL_POSITION.S :=16#40;
        COL_POSITION.R :=16#50;
        ROW_POSITION.S :=16#40;
        ROW_POSITION.R :=16#51;
BEGIN (*LOCATE*)
        ROW_POSITION^ :=CHR (ROW -1);
        COL_POSITION^ := CHR (COL -1);
END;  (*LOCATE*)
PROCEDURE CLEAR;
        (* Clears display screen to blanks with normal
           attribute. *)
CONST
        BLANK = ' ';
        NORMAL_ATTRIBUTE = CHR(7);
        CRT_BUFFER_SIZE = 4096;
        COLOR_DISPLAY = 16#03D4;
        DISABLE_DISPLAY = 16#21;
TYPE
        CRT_BUFFER=     ARRAY[0..CRT_BUFFER_SIZE
                        =1] OF CHAR;
VAR
        SCREEN:         ADS OF CRT_BUFFER;
        CRT_TYPE [STATIC]:      ADS OF WORD;
        CRT_MODE [STATIC]:      ADS OF BYTE;
        SAVED_MODE:             BYTE;
VALUE
        CRT_TYPE.S := 16#40;
        CRT_TYPE.R := 16#63;
        CRT_MODE.S := 16#40;
        CRT_MODE.R := 16#65;
BEGIN (*CLEAR*)
        (* Load screen address for color or monochrome
           display *)
        IF CRT_TYPE^  = COLOR_DISPLAY THEN
                BEGIN
                SCREEN.S :=16#B800;
                SCREEN.R := 16#0
                END
        ELSE
                BEGIN
                SCREEN.S := 16#B000;
                SCREEN.R :=16#0
                END;
        (* Save current crt_mode *)
        SAVED_MODE := CRT_MODE^;
        (*Disable display*)
        CRT_MODE^ := DISABLE_DISPLAY;
        (* Move cursor and force scroll *)
        LOCATE (25,1);
        WRITELN;
        (* Move blank and normal attribute to first two bytes
           of screen. *)
        SCREEN^[0] := BLANK;
        SCREEN^[1] := NORMAL_ATTRIBUTE;
        (* Duplicate the first two bytes in the rest of the
           screen *)
        MOVESL (SCREEN,ADS
          SCREEN^[2],CRT_BUFFER_SIZE=2);
        (*Restore old crt mode *)
        CRT_MODE^ := SAVED_MODE;
        LOCATE (25,1);
        WRITELN;
END;  (* Procedure CLEAR *)
BEGIN (*PROGRAM VIDEO*)
        CLEAR;
        LOCATE (1,1);
        WRITELN ('enter row, col');
        READLN (MAIN_ROW,MAIN_COL);
        LOCATE (MAIN_ROW,MAIN_COL);
        WRITE ('X');
END.    (* PROGRAM VIDEO *)
```

Figure 3.

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long instead of 32K. Also, because most of us are more familiar with characters than with hexadecimal codes, we define the array's components as characters instead of bytes. Now we can use array notation to refer to individual characters on the screen, just as we did in our *adsmem* example.

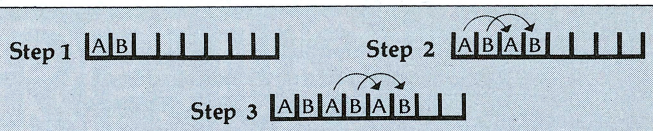
To load the correct screen memory address into *screen*, *clear* peeks into the contents of address 0040:0063, where DOS stores information on which adapter you have. We call this location *crt_type* and assign it the correct address in the *value* section. We know from the *Technical Reference* manual that if a color/graphics monitor is attached, that location will hold the hexadecimal value 03D4, which we have defined as the constant *color_display*.

When we begin the routine, we test to see if *crt_type* holds that value. If so, we load the address of the color/graphics memory buffer into the variable *screen*; if not, we load *screen* with the addresss of the monochrome-display memory buffer.

To Be Perfectly Clear. Before clearing the buffer, we have one more bit of housekeeping. The *Technical Reference* manual warns against moving characters into the color/graphics buffer while in eighty-column text mode, except during the vertical retrace interval. That means we need to turn off the electron beam while we're fiddling with the memory buffer, or we will get a flash of garbage on the screen. To do this, we move the hexadecimal value 21, which we have defined as the constant *disable_display*, into memory location 0040:65, which we call *crt_mode*.

The processor on the video adapter recognizes hex 21 as the bit pattern that turns off the electron beam. If we were writing in assembly language, we could send the bit pattern to the video adapter with an *out* instruction to the proper port. Since IBM Pascal doesn't talk directly to machine ports, we have to resort to a trick.

The trick is that DOS sends the bit pattern in *crt_mode* to the video processor when it scrolls the screen. So we use the *locate* procedure to move the cursor to the bottom of the screen and write a line to force a scroll. Voila! The electron beam goes off.



Step 1 shows a string before movesl is invoked. In step 2, movesl moves the A in the first byte to the third byte, and the B in the second byte to the fourth byte. Step 3 repeats this leapfrog action, moving the A in the third byte to the fifth byte, and the B in the fourth byte to the sixth byte. Movesl will continue this process for the number of bytes specified in the length parameter L.

Figure 4.

In the Clear. Now we're ready to clear the screen. First, *clear* loads the first two bytes of information into the screen buffer. Video adapters require two bytes to define each character. The first byte contains the ASCII character code. The second contains an attribute code, which can be normal white (or green) on black or can specify such things as high intensity or reverse video. For *clear*, we use the normal attribute, *chr(7)*, which we stored in the constant *normal_attribute*.

To move these characters to the buffer, we use the pointer referent array notation:

```
SCREEN^[0] := BLANK;
SCREEN^[1] := NORMAL_ATTRIBUTE;
```

Now we use the IBM Pascal *movesl* to fill the buffer with these two characters. *Movesl* moves a string of bytes from one area of memory to another, beginning at the left side of the source string and moving it byte by byte to the target string. It can also leapfrog part of a string to itself, as illustrated in figure 4. We use this leapfrog feature to fill the *screen* buffer.

The IBM Pascal manual defines *movesl* as

```
PROCEDURE MOVESL (S,D: ADSMEM; L: WORD);
```

where S is the address of the source string, D is the address of the destination string, and L is the number of bytes to be moved. Note that S and D are *adsmem* types. Since all segmented address types are compatible, we can use any segmented address variable as our actual parameters. And that's what we do in our call to *movesl*:

```
MOVESL (SCREEN, ADS SCREEN ^ [2],
CRT_BUFFER_SIZE=2);
```

Here *screen* is an *ads* type specifying the beginning of the source string. *Ads screen^[2]* is an *ads* type referring to the beginning of the destination string. And *crt_buffer_size=2*, or 4,094, is the number of bytes to be moved. We aren't filling the entire buffer, because we've already moved the necessary characters into the first two bytes.

We're done, except for a little cleaning up. We turn the electron-scan beam back on by restoring the previous contents of *crt_mode*, once again forcing the screen to scroll and sending that value to the video adapter. Finally, the screen is clear.

You May Need Assembler. Address pointers permit access to some of the machine-level functions that usually require assembly language. However, address pointers by themselves often cannot achieve desired results, such as disabling the video processor's electron beam. Currently, IBM Pascal falls short of the goal, stated in the manual, that "operations that are done easily in assembly language should be easy to do in IBM Pascal." For some machine-level functions, you still need assembly language subroutines.

Nevertheless, *address pointers* do give IBM Pascal the same capabilities as Basic's *peek* and *poke* statements, and *super arrays* offer enhanced control of memory allocation. Both can make your programs more powerful and easier to write, and are welcome extensions of Standard Pascal. ▲

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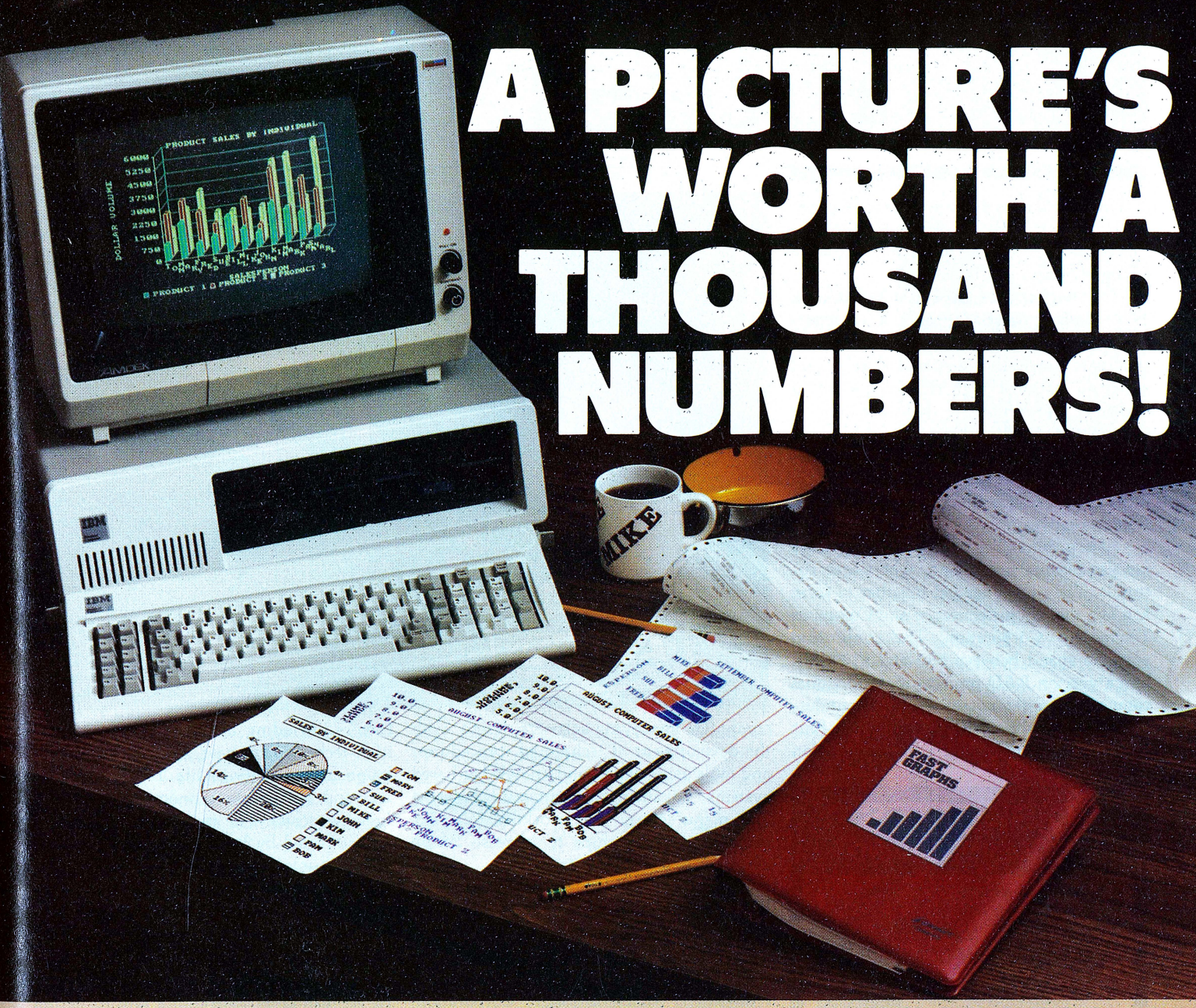

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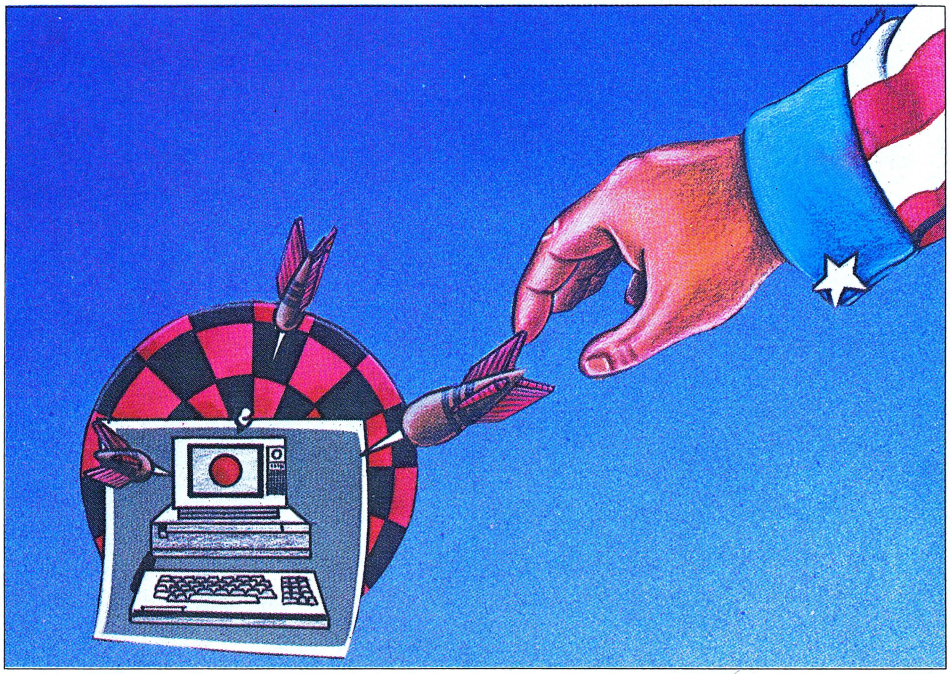
Δ **The U.S. Strikes Back.** It appears the U.S. government and the electronics industry are finally getting serious about the FCC—the Foreign Computer Challenge.

The Reagan administration's proposed 1984 budget, which earmarks a whopping $45.8 billion to military and civilian R&D programs, includes one major computer goody—a national high-technology lab at Berkeley, California. At the same time, a Congressional bill asking for upward of $400 million for upgrading math and science education, in United States secondary schools, is gaining favor in the House of Representatives.

Fifteen blue-chip computer companies are also putting their money where their future is. They have banded together to form MCTC, the Microelectronics and Computer Technology Corporation. The consortium plans to spend between $50 and $100 million a year on R&D projects that individual companies would not or could not undertake by themselves. MCTC will initiate four R&D projects: designing a fifth-generation computer; improving software design, with the development of techniques, procedures, and tools using expert and knowledge-based systems; advancing computer-aided design and manufacture; and working out new ways to package chips to increase design efficiencies.



Founding shareholders of MCTC read like a *Who's Who* in computers and electronics. They are Advanced Micro Devices, Control Data Corporation, Digital Equipment Corporation, Harris Corporation, Honeywell, Motorola, NCR Corporation, National Semiconductor, RCA, Sperry, Mostek Corporation, Xerox, Signetics, and Westinghouse Electronics.

"Most journalists tend to view this as our response to the Japanese threat," says William Shaffer of Control Data, an MCTC interim spokesman. "But there's an MCTC-like organization within the European Common Market called Esprit. They're coming from the back of the pack, the Europeans, but they're moving very rapidly." Apparently the Far East is not the only competitor worth keeping an eye on.

The MCTC, which will be headed by retired admiral Bobby R. Inman, hopes to be up and running by 1984. It is currently evaluating thirty-six sites for the organization's facilities. "There could be as many as five sites and as few as one," says Shaffer. "With four programs and headquarters personnel, it may make sense to colocate one or more at a single location."

Site reviewers are weighing a number of factors, including an area's university and high-tech industry base, vendor/supplier relationships, quality of life, ready access by air, and boilerplate economics (taxes and housing costs). The review process should be completed by late spring, Shaffer says.

Site selection may be the least of MCTC's problems, however. "A cloud of uncertainty" hangs over the project, according to Control Data president Robert M. Price, because of confusion over federal antitrust policy. MCTC shareholders would like to see Congress amend the law to permit R&D ventures such as theirs. The U.S. Justice Department did not block the formation of the company but has said it reserves the option to file an antitrust action in the future, a position that has led some twenty-five companies reportedly interested in joining MCTC to balk at committing themselves.

The size of the administration's proposed R&D budget and the relative lack of Congressional opposition to it suggest that MCTC supporters may find Capitol Hill receptive to special legislation. In Washington these days, high-tech is in. "Whether you agree or disagree with the President's view of the world," Caltech economist Roger G. Noll told the *Los Angeles Times*, "the fact is that this budget document—unlike his first two—is a national pursuit of rational objectives."

The rational objective that has emerged reflects a growing national commitment to high technology. Government and industry have worked together before—to build the

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railroads and put a man on the moon—and such cooperation is demanded now to match similar efforts by the Japanese and the Europeans, many experts believe.

Eugene Haller of the Lawrence Berkeley Laboratory notes that the United States hasn't been as quick as other countries to recognize the close connection between basic research and industrial applications. "We've tended to make breakthroughs in the laboratory and then left it up to industry to make use of it," he told the *Los Angeles Times*. "And what we've noticed is that the Japanese and Germans have been a lot quicker to jump on things than our fellow Americans."

Jumping on things in the future is going to take more than a garage in Silicon Valley. It will require prodigious commitments in money and personnel and call for creative and efficient means of organizing research efforts.

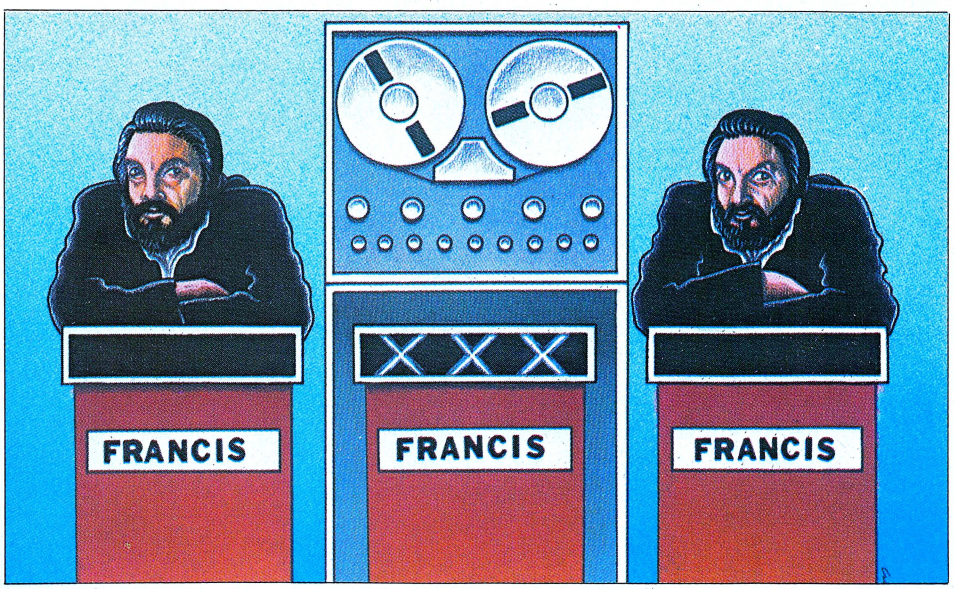
"The United States has tough antitrust laws that in the past have served to stifle cooperation between companies in research," observes Philip H. Abelson, the editor of *Science*. "In consequence, there is a tremendous waste of scarce resources of people and excessive duplication of effort in our industrial research. Companies often must rediscover the same phenomena.

"The Bell System and IBM are sufficiently big and entrenched that they are secure for at least a while. But smaller companies such as those in MCTC are unlikely to prosper in the longer term if they must go it alone."

Δ **Computer Minds.** There are two schools of thought on the development of thinking machines. The artificial intelligence *engineers* ask, why not develop mental tools, just as we develop physical tools, to help us accomplish things? The artificial intelligence *scientists* ask, why don't we try to understand what intelligence is about? Not just to make thinking machines, but to develop programs that behave intelligently, to understand better how the mind of man works.

The more popular engineering school wants to replace the mind with a machine that does the job better. The scientific school, in the minority, wants to explore the mind with a machine. So the scientific school is breaking down the mental process of discovery into programming attempts at re-creating the logic of the mind.

One of these programs is *Wok*, developed as part of a research project at Yale University. *Wok* works much the way an enterprising chef would. When a dish requires an ingredient not on hand, such as chicken, *Wok* juggles ingredients and spices to come up with an alternative, such as pork. Researchers say some of *Wok*'s concoctions "don't taste too bad."

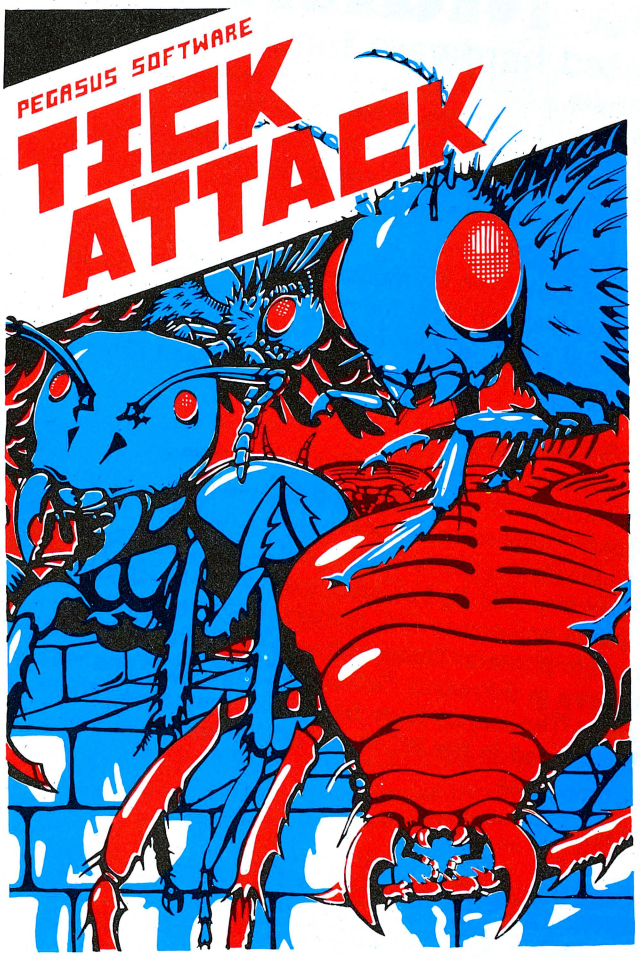


Another program, called *Bacon*, is a time-sharing mainframe project at Carnegie-Mellon University in Pittsburgh, Pennsylvania, under the supervision of Herbert Simon, a pioneer in artificial intelligence research. Simon contends that we don't know enough yet to replicate the human thinking process.

"We're still very far from having any single program that has the range of knowledge that a normal human being would carry around," he says.

Bacon demonstrates human-style creativity and problem-solving. If given the basic information available to the astronomer Johannes Kepler, *Bacon* can come up with Kepler's Third Law, which relates the distance between a planet and a sun to the time it takes the planet to orbit that sun. It can also sift through data and discover Ohm's law, which defines the relationship between resistance, voltage, and current in a circuit.

Bacon, which is programmed in Lisp,



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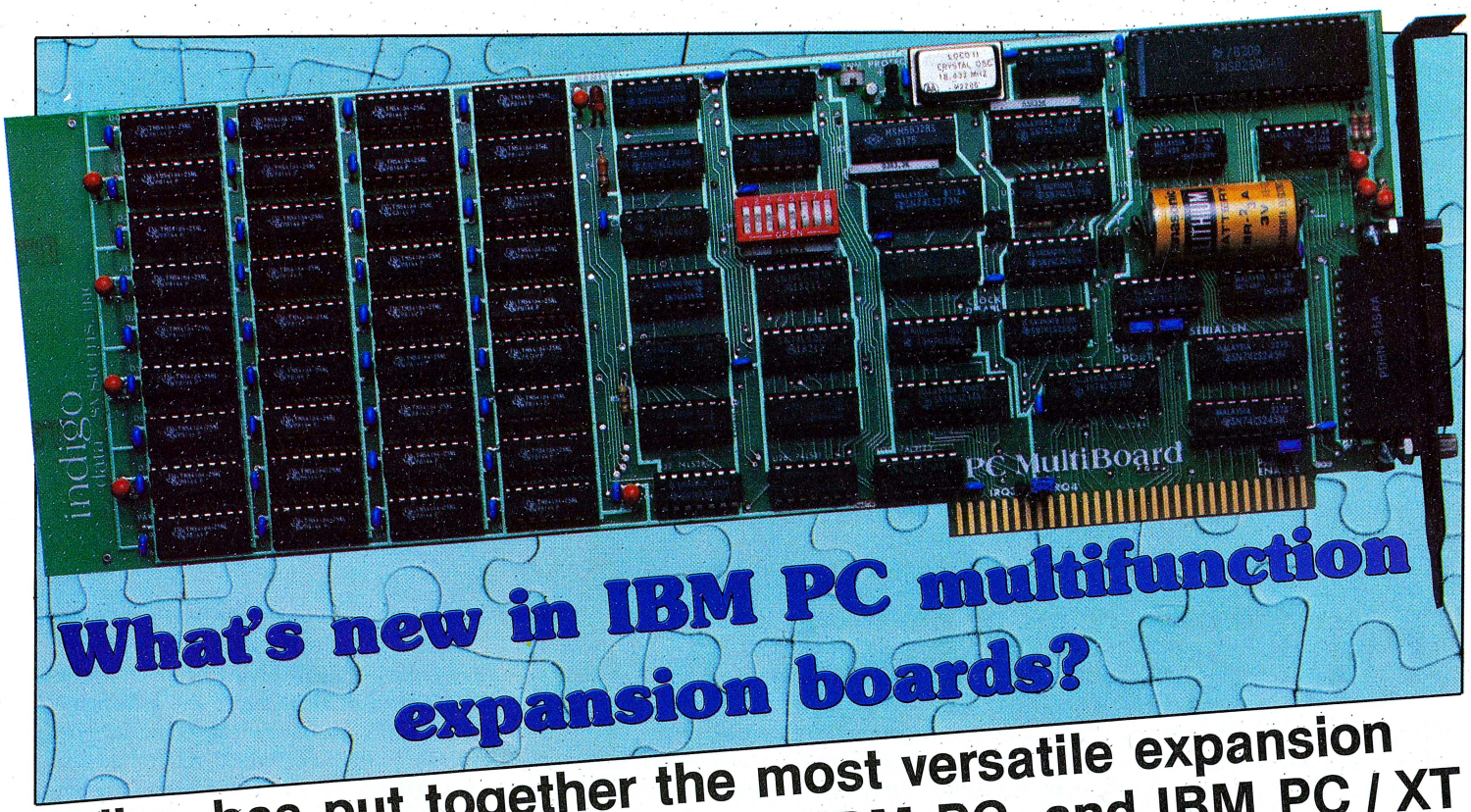

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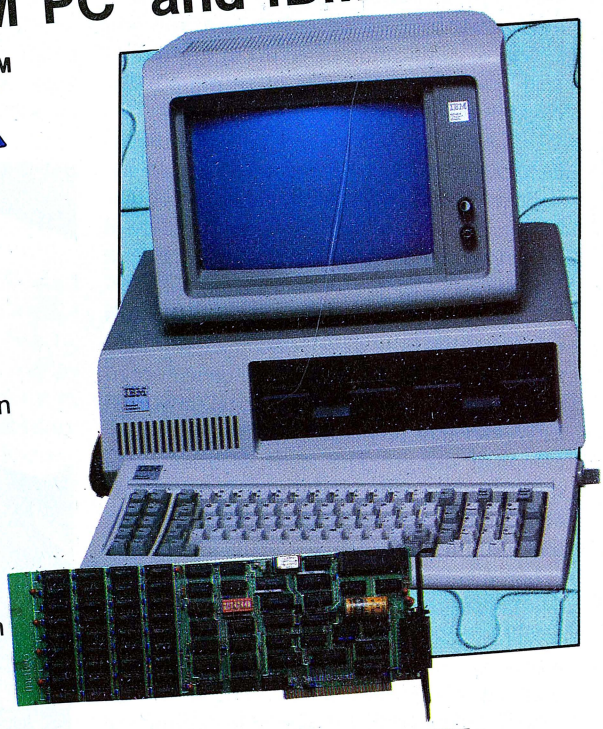

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isn't intended merely to replicate what people have already discovered. Researchers use it to look for heuristics—rules of thumb in the relationships between numeric variables.

"*Bacon* doesn't have a picture in its mind," says Patrick Langeley, a grad student on the project. "But it can come up with a concept." Langeley did his thesis on the program. "We want to find the law that summarizes the given data, and we direct the search down specific paths," until a total comprehension of the input is reached by the program.

Another program, also developed at Yale, mimics the knowledge of former secretary of state Cyrus Vance. When *Cyrus* was asked, "When did your wife meet Begin's wife?" it replied, "At a state dinner in Israel in January 1980."

Cyrus's answer is historically correct. What makes it significant is that *Cyrus* was not programmed with information on wives, only on state dinners. According to Dr. Janet Kolodner, who developed it, the program went through a multistep reasoning process to come up with the answer. First it determined that the women would have met at a social event, then it decided that the event would have to have been of a political nature.

"Since it knows about state dinners, it narrowed in on that," says Kolodner, who hopes to develop a world affairs expert program capable of offering political advice.

Computers can manipulate artificial structures just as people can. No problem. The challenge in artificial intelligence projects like *Wok*, *Bacon*, and *Cyrus* is in designing a system of common sense that both computers and human beings can use.

Δ **Psychology Today.** For the past two to three years, psychologists and patients alike have reaped the benefits of the automated cotherapist. In our rapidly evolving information society, some psychologists think that patients are less inhibited giving information to a computer than to the psychologist.

Dr. J. Fred Hurst of Boise, Idaho, has been using the Psychometer 3000 for a year now. Hurst says he chose this system mainly for its versatility, adding that the computer saves the clinician and the patient both time and money.

A variety of psychological tests come on disk with the Psychometer 3000. The computer administers, scores, and interprets the tests. It also prints out test results, including case interpretations.

The patient interacts directly with the computer. Since the computer's keyboard is designed for very simple patient responses such as yes, no, don't know, and help (in case the patient needs further instruction), the confusion and complexity of the usual computer keyboard is eliminated.

The Psychometer compares the patient's answers to those given in thousands of other cases before making its analysis. There is less chance of biased results, according to Hurst.

"However," Hurst admits, "whenever a human interpretation is made, even of numbers, we still have some subjective input. We want to minimize that subjective input so that our interpretation is as objective as humanly possible.

"Reliability is the most expensive thing we have to deal with, and that's what we strive for," Hurst explains. "A computer helps us achieve that more rapidly and in a much more objective way."

Although the Psychometer 3000 is doing some of the same work formerly done by the psychologist, Hurst stresses that the machine in no way lessens the importance of the clinician. By relieving the psychologist of the tedious, time-consuming tasks of administering tests and generating attendant paperwork, the computer allows more time for creative human interaction with the patient. According to Hurst, before the computer was available, the preparation of test results alone took about four hours. Now, with the aid of the Psychometer 3000, test results are analyzed and ready for use in about ten minutes.

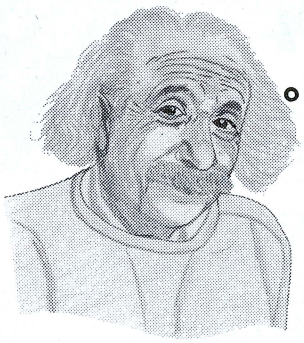
Included with Hurst's Psychometer 3000 system are a printer, psychological-testing software, and software for word processing and billing. His package also includes an optional keyboard for programming and a remote portable assessment terminal (PAT).

The PAT 100, about the size of a backgammon game and weighing around two pounds, is easily transported, thereby enabling Hurst to make "house calls." The portable unit holds from five to ten tests. Test data can then easily be transferred by modem into the main computer for processing.

Hurst says that the computerized testing through the portable terminal is also helpful in preparing for court cases. It enables him to conduct tests immediately prior to giving courtroom testimony, thereby presenting the most recent data possible.

In reference to the use of computers in psychology, Hurst says, "There are new tests being programmed for this particular unit, and I think we're going to see that this whole computerized psychological-testing approach is going to expand. How far is limited only by the imagination."

Dr. Thomas McDonald, a psychologist at Transition Associates in San Diego, California, agrees that computers are playing an important role in the behavioral sciences. However, McDonald feels that they could



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play a much bigger part, given the opportunity.

"We need to get more accustomed to using them instead of being threatened by them," says McDonald. "Working with computers is a partnership, and we professionals are the ones who are falling short, not the computers. Once we realize that they are only tools, I think they will be used on a much wider scale in the field of psychology."

Δ **Coming Attractions.** Last summer, moviegoers were treated to several Hollywood films that either were produced with the aid of computers or featured computers in the story.

Star Trek II: The Wrath of Khan featured gorgeous computer-generated graphics created by George Lucas's special effects firm Industrial Light and Magic. *Blade Runner* also had fantastically intricate beautiful effects, and its high-tech subject matter made the film thought-provoking on a number of levels.

Tron tried harder than any other film to bring computers into films and the filmmaking process. Unfortunately, *Tron*'s failure to perform at the box office as predicted created some doubt in the minds of Hollywood producers about the true drawing power of the subject matter and the method. With its weak script and weak or nonexistent characters, *Tron* was simply a special effects showpiece, and it's not surprising that audiences stayed away. Up against such tough competition as *E.T.* and *Rocky III*, *Tron* needed more than just great special effects to be a success.

In the summer of 1983 expect to see a number of computer-generated and computer-related films. None of them will help you relocate DOS or, for that matter, tell you the difference between a Cray-1 and an Otrona Attache. But if you're into the summer movie scene, here are some films to be on the lookout for.

Blue Thunder, from Columbia, stars Roy Scheider as a Vietnam vet and helicopter ace hired by the Los Angeles Police Department to thwart terrorism during the 1984 Olympics. A secret government agency equips Scheider with Blue Thunder, a supercopter equipped with the latest in computer surveillance technology. Scheider can eavesdrop electronically or use a thermographic scope to look through walls. If necessary, the helicopter can fire four thousand rounds per minute or resort to its six 20mm cannons. Not surprisingly, Scheider ends up battling the government, not terrorists.

Superman III, from Warner's, once again finds Christopher Reeve portraying the Man of Steel. This time around he falls for Lana Lang (Annette O'Toole) and battles a master criminal (Robert Vaughn, who else?) who has enlisted computer genius Richard Pryor in a plot to acquire immeasurable wealth and power. Much of the film's action occurs in Vaughn's hideout, dubbed the Computer Cave. Superman eventually comes up against the Ultimate Computer, which tries to trap him with an energy web, among other things.

Android is a low-budget effort starring Klaus Kinski as a slightly loony scientist. Kinski's experiments with sophisticated robots attract the nefarious attention of intergalactic convicts. It's played mainly for laughs.

Tin Man stars Timothy Bottoms, Deana Jurgens, and "Osgood" the computer. The ad line for this one reads, "His world was silent. His love was computers. . . . Until he met her."

Crosstalk is an Australian film focusing on a man who develops a supercomputer when confined to his apartment by an accident. Mysteriously, his work leads him into a vortex of murder and technological horror.

Films that will most likely include computer-generated effects are *Return of the Jedi* (Fox), *Something Wicked This Way Comes* (Disney), *Twilight Zone* (Warner's), and *Space Hunter: Adventures in the Forbidden Zone* (Columbia), the latter in 3-D. There's a good chance that both James Bond films, *Octopussy* (MGM-UA) and *Never Say Never Again* (Warner's), will have computers involved in the action.

Network TV is also getting into the computer scene. Look for an as-yet-untitled pilot from Paramount about a couple of guys in the computer biz. One of them is a nerd who creates new concepts. Paramount Television president Gary Nardino says, "It's like a Martin and Lewis relationship, but much warmer."

Also, CBS is planning a pilot and hoping to do a series called *Whiz Kids*. The pilot centers on "young computer geniuses," one of whom finds out how to use his personal computer to gain access to a large computer containing the transactions of an influential land developer. Something looks suspicious to the young hacker and the game is afoot.

Δ **Bowie and the Clash Headline Fest.** The 1983 Us Festival returns to Glen Helen Regional Park in San Bernardino, California, on May 28-30 and June 4.

Once again music is taking the media spotlight; Steve Wozniak's Unuson organization has announced a strong lineup of new wave and heavy metal/rock bands for the first three days, and a solid day of country-western music acts is scheduled for June 4. Nonetheless, Unuson and Wozniak have made clear that this year's technology fair

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will be bigger than last year's.

Plans call for an expanded technology expo that includes information on career opportunities in technological fields. Wozniak himself is in charge of this portion of the '83 Us Festival; he's lining up representatives from different corporations to speak at the three-day fest.

This year's technology fair will feature a tent devoted to organizations embodying the Us Decade philosophies of "teamwork and pulling together." Neighborhood Watch and similar community-minded groups are good examples.

Unuson is hoping to have another two-way television transmission between the United States and the Soviet Union. "We're talking with them and they're interested, but nothing has been solidified," said a Unuson official. A two-way transmission with the People's Republic of China is also possible but has not yet been confirmed.

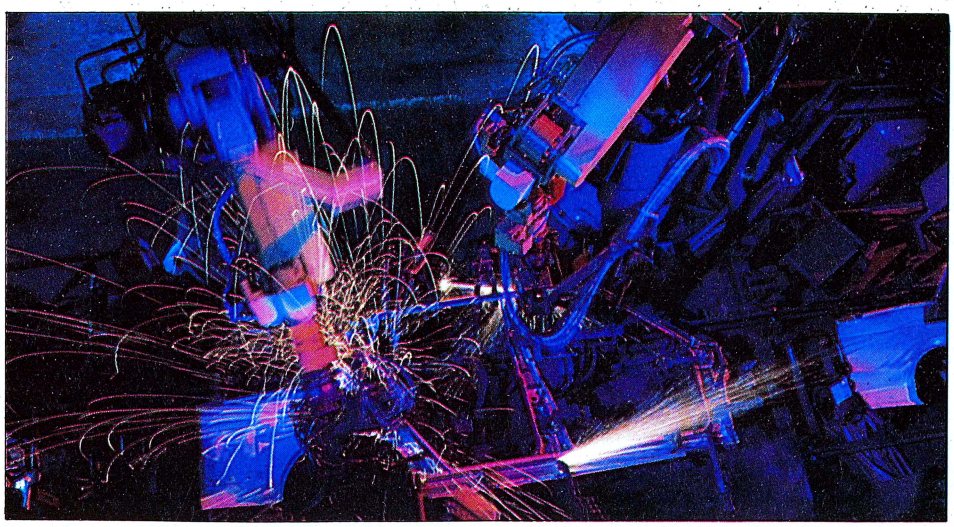
Those attending more than one day and using the adjoining campsites will be charged a nominal parking fee. The camping area will open at 8:00 p.m. on Friday, May 27. The next three days the schedule will be the same, the festival area gates opening at 8:00 a.m., with the career and technology expo opening at 10:00 a.m. The music on all three days will start at noon.

Δ **Roll Over, Tchaikovsky.** The makers of *Ballet Robotique* say their film is a short, space-age fantasy, "strictly a work of entertainment," as opposed to just another "industrial film." Directed by Bob Rogers, photographed by Reed Smoot, and made possible by a grant from GM, *Ballet Robotique* is a tasty gem, a zesty romp through a half dozen assembly plants across the country. It's eight minutes of graceful spray painting, dynamic die-casting, and warlike welding, starring the big boys, heavyweight industrial robots.

Nominated for an Academy Award in the Live Action Short Film category, *Ballet Robotique* is a well-crafted film that attempts to present industrial robots as something more than dumb machines and something less than R2D2 and C3P0. The film-makers have used evocative lighting and clever editing to endow the robots with personalities of a sort, in much the same way cartoons and animated films treat animals as almost human.

Ballet Robotique features more than a dozen different industrial robots performing their normal tasks; no special reprogramming was done for the film. Shooting in real auto plants, the film-makers had some control over the atmosphere, but interrupting normal operations on an assembly line was out of the question—too expensive (around six thousand dollars per minute).

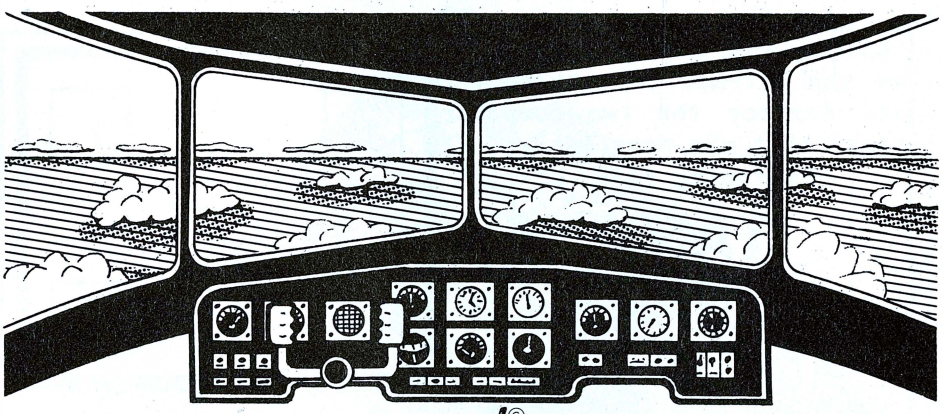
Still, the precise movements of the robots are tailor-made for synchronized editing to classical music, in this case that of Bizet, Delibes, and Tchaikovsky. When you watch the film, it seems as though the robots had to have been controlled by the film-makers, but such is the magic of the cinema. The subtle color schemes and murky atmosphere of the film were often manipulated by Rogers and Smoot for a desired effect—cinema magic of a different kind.



The result is great fun. "In the dark abyss, deep blue swirls of smoke curl up from the depths below," said Rogers in a recent *American Cinematographer* article on the making of *Ballet Robotique*. "An eerie red glow emanates from within the blackness. Suddenly the gleaming silver arms of the robots rear up and plunge forward, shooting sparks that leap and pirouette in arcs of fire. Spitting sparks, breathing smoke, they crackle as they plunge again and again to attack."

Ballet Robotique climaxes with huge welding robots sending showers of sparks flying in time with Tchaikovsky's *1812* Overture. Rogers and Smoot tried to make it look like a laser battle in outer space.

Your chances of seeing this film in a local



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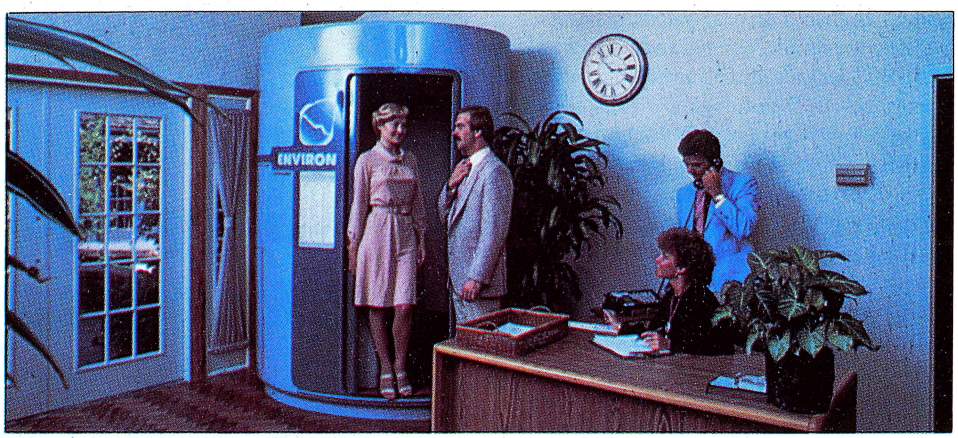
theater are slim at best. Even with an Academy Award nomination, *Ballet Robotique* is one of countless short films you always hear about and never see. It deserves wider exposure. Currently, *Ballet Robotique* is being distributed by Pyramid Film & Video of Santa Monica, California. You can purchase or rent a 16mm print or videocassette of the film at a reasonable price.

Those interested in robots, whether their jobs are threatened by one or not, will discover that *Ballet Robotique* is definitely not a "typical industrial film."



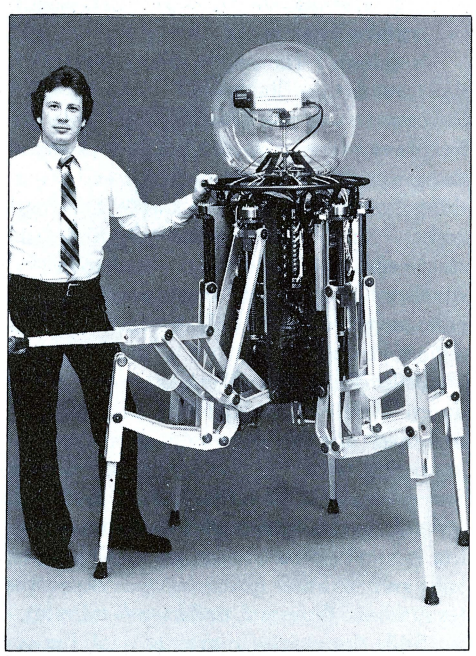
Δ Step in, Close Your Eyes, Kick Back, and Unwind. Stress in the working environment, particularly the modern office environment, is a problem that Environ of El Toro, California, is attempting to alleviate with a microprocessor-controlled, telephone-boothlike contraption. Called an Environ Personal Retreat, the pale, smokestack-shaped, soundproof enclosure is ninety-two inches high, seventy-seven inches long, and forty-eight inches wide. The retreat is equipped with a low-friction sliding door, exterior and interior graphics (no video or CRT screen, though) with optional color treatments, a ceiling-mounted color-generating unit, an air-purification system with multidirectional flow, atmospheric ionization, orthopedically designed body lounge, a digital pulse meter, and sound imaging. When the job gets to be too much, you simply enter the Environ Retreat, close the door, and play one of the many different programs. Users can listen to music, perform relaxation exercises, receive training, and concentrate on motivation and personal development. The lights, audio, and air quality can be controlled to provide the most relaxing and stress-reducing atmosphere. Environ believes that athletes preparing for a race or game could benefit from this product. The old psyching up could become the old hiding-out-till-the-last-minute. The company plans to start shipping product by midyear.

Δ But Can It Chew Gum at the Same Time? A month and a half ago, a small Anaheim, California-based company revealed a spectacular robot called the Odex I. Odetics spent two years developing what it calls a "functionoid," a six-legged, walking robot.

The idea was conceived eight years ago, and indeed the challenge of building a walking robot has beckoned roboticists for longer than that. Odex I is a truly revolutionary breakthrough in robot development, and it's not surprising that in the still-young robotics industry a small company like Odetics was the one to realize it.

With its six "articulators," Odex I can traverse any terrain, maneuver through environments designed for human movement, climb up and over obstacles, support weights far greater than its own, and assume a number of different "profiles." Odex I is capable of six basic positions: tucked, tall, squat, normal, low profile, and narrow. The accompanying photo shows the Odex I in the normal, wide articulated position.

The Odex I weighs three hundred seventy pounds and can carry a maximum of one thousand pounds at its fastest speed and



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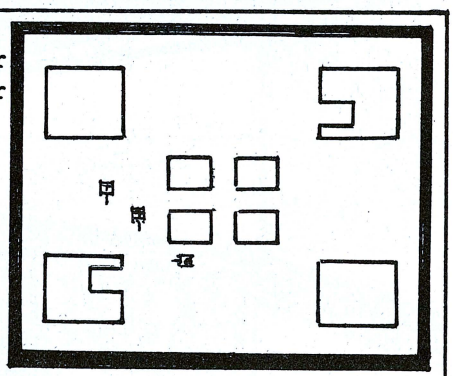

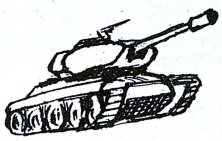

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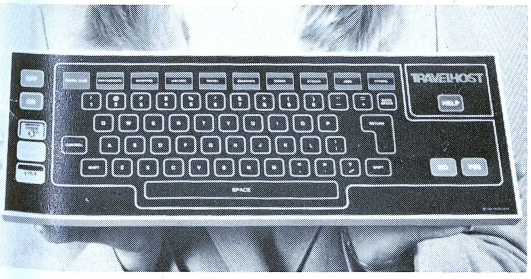
eighteen hundred pounds at its slow speed. In its initial showing, Odex I climbed into the back of a pickup truck, climbed out again, and then picked up the back end of the truck and dragged it across the room.

The robot can be adapted for specific industrial applications which, according to Odetics, include mining, agriculture, space and sea exploration, security, surveillance, forestry, construction, material handling, nuclear-power-plant maintenance and repair, and military applications.

Δ **How To Avoid the Can't-Find-the-Movie-Section Blues.** A free videotex service called Buy-Phone has started up in West Los Angeles, California. Using standard 300-baud ASCII communications, personal computer users can access over ten thousand listings covering all kinds of consumer products, services, and entertainment. A user wanting to see a particular motion picture, for example, calls up Buy-Phone and the various theater locations are displayed in order of their distance from the user. Within Buy-Phone's database are over sixteen hundred restaurants, indexed by their nationality, ambiance, entertainment, and other features. Currently operational only in West Los Angeles, Buy-Phone has plans to expand into other areas soon. Buy-Phone can be reached by modem at (213) 474-0270.

Δ **Welcome to the Hotel Videotex.** Travelhost, based in Dallas, Texas, is bringing videotex technology to hotels around the country. Using a Travelhost terminal and a television set, hotel guests can send and receive electronic mail, shop, call up news and stock quotations, check airline schedules, and—you guessed it—play video games. The terminal has a membrane touch-panel keyboard and a built-in 300-baud modem, and is



capable of creating a forty-character-by-twenty-four-line color or black-and-white display on a VHF channel. Selected Hiltons, Sheratons, Holiday Inns, Howard Johnson's, and Ramada Inns have signed contracts with Travelhost.

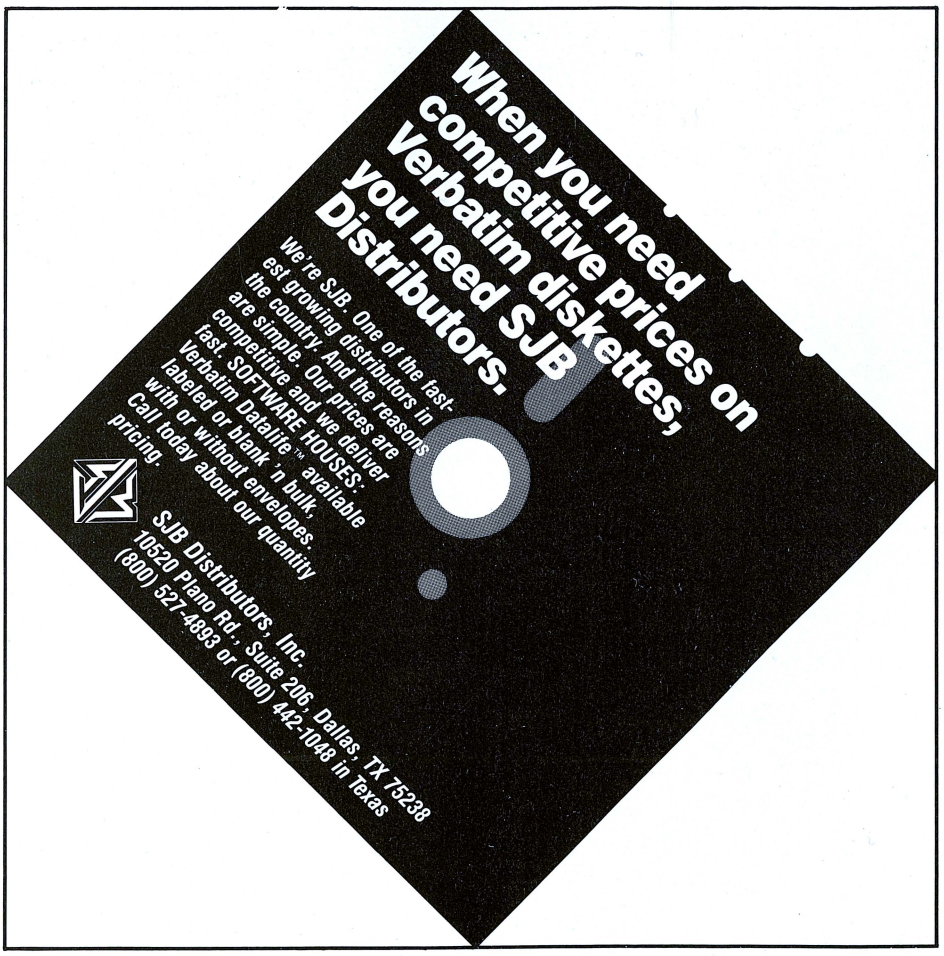
Δ **New Mag for Computers on the Move.** Miller Freeman Publications (San Francisco, CA) is offering a new computer magazine, *Portable Computer*. The name says it all. The premier issue had a listing of all the known portable computers currently available (about forty), as well as an interview with Adam Osborne, an article on how to make your Apple even more portable than it already is, and the usual news, tips, and advertising. The April/May issue of *Portable Computer* features articles on portables in the school, networking with portables, and portable terminals.

Δ **The Rumormonger Ruminates.** Does Luke Skywalker die? Is Princess Leia the "other"? Will the Jedi really fail to get their revenge on the evil empire? These and other questions will finally be answered on May 25, when *The Return of the Jedi* opens nationwide. The details are sketchy, but informed sources have it that the upcoming Pete Shelley album, *XXI*, is coded in computer language so that lyrics will appear when listeners play the record hooked up to a video screen. . . . The list of IBM's rumored upcoming products, including "Peanuts" and "Popcorn," has grown by one more. "Bon Bons" is the project name for a high-speed, chocolate-covered modem capable of transmitting data from a pc to a host computer before the ice cream melts. Company officials denied reports of an upcoming product called "Nachos"—a three-inch disk drive with salty triangular disks and optional melted cheese software. Post-April Fool.

Δ **NCC, Not Just a Mickey Mouse Affair.** The annual National Computer Conference (NCC) will be held in Anaheim May 16–19 at the Anaheim and Disneyland Hotel convention centers. This massive show features exhibits of computer products and services, technical sessions, and seminars.

The keynote address will be given at 9:30 a.m. on May 16 by John P. Imlay of Management Science America. Admission: $40 per day or $100 for all four days. The exhibits will be open from 10:00 a.m. to 6:00 p.m. the first three days and on the final day from 10:00 a.m. to 4:00 p.m.

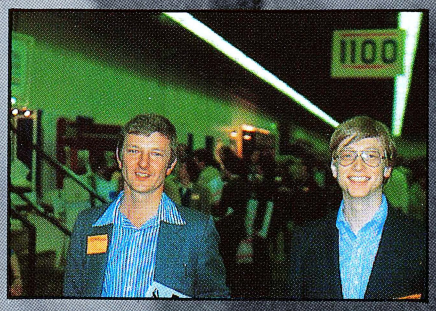
Δ **Tubular Computer Shopping Malls.** The computer industry will soon have its own version of the merchandise marts—industry markets, found in cities like Chicago and Dallas. Both the Pacific High Technology Trade Center and the California DataMart will be located in the San Francisco Bay Area. The Pacific center will be a four-hundred-thousand-square-foot computer "shopping mall," according to developer Ron Kaufman. The California DataMart will be located next to Showplace Square, a merchandise mart in San Francisco, and will start out occupying one hundred fifty thousand square feet with the option to expand to about five hundred thousand square feet. DataMart's developers, Bay West Development Company and Metropolitan Properties, project the cost for the small business computer mart to be $19 million. ▲



MICRO MADHOUSE

The Eighth West Coast Computer Faire

Above: An unidentified promoter hawked his new Commodore game. Below: Nancy Erickson (left) and Becky Rhines, of Persyst, enjoyed a moment of levity; Microsoft had no booth, but Jim Towne and Bill Gates assured the company's presence at the show; Softalk/IBM readers chose VisiCalc as their favorite program, and the award was accepted by Lisa Underkoffler of Software Arts and Dan Eylstra of VisiCorp.



The most interesting new pc product at the West Coast Computer Faire (March 18–20, San Francisco) was not actually on display at the Faire. Quadram wasn't quite ready for an official announcement of its Apple II emulation board, but it ferried a good many of the press and other industry "insiders" to a nearby hotel suite for a quick peek. And what was shown looked pretty interesting.

The board, which will carry a suggested retail tag of $680, combines a 6502 with 64K of memory, an Apple DOS 3.3 disk controller, a game port, and all the other circuitry required to make your pc behave like an Apple II. Quadram vice president Leland Strange says the only compatibility problems the firm has encountered have been with certain (not all) copy-protected Apple programs—and that some of the publishers of those programs are considering unprotecting their wares in return for an entree into the IBM market.

On the show floor itself there wasn't a lot that was exciting. Amdek had a new color/graphics adapter and a four-pen plotter; Quadram showed an RGB monitor in the $700 range that it hopes will compete effectively against IBM's new monitor; Lifetree demoed its international version of *Volkswriter*, and Continental Software previewed an appealingly designed file-management system called *Megafile*. IBM had upstaged itself by announcing the XT two weeks earlier, but the Faire gave many a first look at the company's hard disk and at DOS 2.0.

Attendance, of course, was up; is there any other direction in this industry? Faire promoter Jim Warren reported just under fifty thousand registrations. The hobbyist character of this show has diminished considerably over the last couple of years (although you can still buy chips and kits at some booths), but this is still the preeminent end-user exhibition of the year. More than ever, 1983's crowd seemed to include computer nonusers who were getting ready to take the big plunge.

There was also, compared to last year's show, an enormously swollen contingent of the pc faithful. No surprises there. One entire room on the upper level was devoted to IBM-related exhibits (a similar room down the hall was set aside for the Apple flock). But, of course, there was also plenty of pc stuff amongst the hoi polloi downstairs.

IBM itself dominated the IBM room. But Corona and Colby were there too, a couple of booths away. Expect to see a horde of pc-compatibles there next March. ▲

Clockwise from top: Fred Savoia represented Heigen Corporation's IBM PC Reference Encyclopedia; *a family from India were captivated by a new light pen; Kathie Hart (Plantronics/Frederick Electronics), Ted Gillam (TG Products), and Mike Farmer (Continental Software) entertained visitors to their respective booths; IBM's XT and new color monitor dominated a room reserved for pc-related products.*

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softalk presents the bestsellers

The lesson about sales in March is taken from the first book of Apple, 1978: "Yea though you be but a single person, given determination and a good program, you can build a business writing software for microcomputers."

Everybody thought that lesson had been outdated when IBM entered the microcomputer marketplace. Sales in the early months were dominated by such relatively heavyweight software producers as VisiCorp, MicroPro, Microsoft, Sorcim, BPI, Peachtree, and Information Unlimited Software. Cottage software producers appeared to have about as much chance for survival in the IBM pc market as an Iowa farm boy in Boston's Combat Zone.

As it turns out, Horatio Alger is alive and well, living in Carmel Valley under the nom de plume of Camilo Wilson. The name stops you right away. Camilo invokes a Latin imagery of dashing derring-do, while Wilson has a stodgy English ring to it. When your own names seem to clash, what chance is there to beat the odds?

Even worse, the name of his company is Lifetree, a play on the names of Lifeboat and Peachtree. Again there's the internal personality clash. Lifeboat is a distributor while Peachtree is a publisher. So what you have here is a dashing, stodgy distributor-publisher. Is that a combination destined for failure? Are his chances even worse than the Goldwater-Miller ticket? Should he take up fandango dancing or stick to playing *Pong*?

None of the above, as it turns out. Wilson has parlayed his *Volkswriter* word processor into one of the top ten programs in the IBM market. In March it leapfrogged the *EasyWriters* to become *WordStar*'s main challenger.

That's no mean feat, considering *Volkswriter*'s modest beginnings and the nature of the competition. Last year, *Volkswriter* was that funny little program you could buy in isolated software stores that didn't have access to the main contenders. *WordStar* had 75 percent of the word processing market and the *EasyWriters* had the rest. The program had all the chances of a claimer in the Kentucky Derby.

But once in a blue moon, the 100-1 shot comes in. The National Weather Service has not announced a change in the color of Earth's satellite, but it must be imminent, because there in ninth place in March sits *Volkswriter*.

Other than *Volkswriter*'s surge, polling sales for March was monotonous. Everyone answered "1-2-3" to the question of what was selling best. The Lotus Development integrated software package has creamed the entire market, dominating in every area of the country.

What's surprising is that *1-2-3* hasn't had a truly adverse impact on any of the programs that looked vulnerable after its announcement. *VisiCalc* remains strong. *SuperCalc* and *Multiplan* actually gained some ground, so the spreadsheets weren't suffering.

Database programs weren't affected either. Ashton-Tate's *dBase II* remains a strong fifth in the market. *TIM III* took a slight slide while *VisiFile* gained some ground. Outside of the Top Thirty, *EasyFiler* showed signs of renewed life after being moribund since the first of the year. *Condor* and *Personal Data Base* are gaining some adherents.

MBA, the most direct competitor of *1-2-3*, continues to hold its own, although the initiative is clearly with Lotus's newer product.

Ironically, only *VisiTrend/VisiPlot* seems to have been victimized by *1-2-3*. It's dropped totally from view, but the continued strength of *VisiCalc* would seem to imply that it'll make a comeback. *Trend/Plot* was *1-2-3* designer Mitch Kapor's first microcomputer hit.

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Anytime Support

The winter doldrums continue to plague entertainment software. Most titles dropped a few notches and *Microsoft Decathlon* sank out of sight. *Microsoft Flight Simulator* remains the premier entertainment title. FriendlySoft's *PC Introductory Set* jumped over *PC Man*, while Infocom's three entries, *Zork I*, *Zork II*, and *Deadline*, dipped but remained on the list. FriendlySoft's new *PC Arcade* was arriving in stores in the middle of April and drawing raves. Infocom's new *Suspended* should follow shortly.

Biggest jumps among the Top Thirty were *Asynchronous Communications Support 2.0*, going from twenty-fourth to tenth, and Microsoft's *Typing Tutor*, going from thirtieth to twelfth.

New entries included *The Word Plus*, the first spelling program to crack the bestsellers, *PFS:Report*, and *The Instructor*.

March was the first month in which the number of titles mentioned by retailers remained stable. Whether that reflects a lull before a raft of new introductions or a stagnancy in the IBM pc market remains to be discovered.

But the example of Camilo Wilson should strike responsive chords in the hearts of software entrepreneurs everywhere, eventually leading to a wider choice for pc owners. ▲

IBM Personal Computer sales outlets representing approximately 4.1 percent of all sales of pc and pc-related products volunteered to participate in the poll.

Respondents were contacted early in April to ascertain their sales for the month of March.

The only criterion for inclusion on the list was the number of units sold—such other criteria as quality of product, profitability to the computer store, and personal preference of the individual respondents were not considered.

Respondents in April represented every geographical area of the continental United States.

Results of the responses were tabulated using a formula that resulted in the index number to the left of the program name in the Top Thirty listing. The index number is an arbitrary measure of relative strength of the programs listed. Index numbers are correlative only to the month in which they are printed; readers cannot assume that an index rating of 50 in one month represents equivalent sales to an index number of 50 in another month.

Probability of statistical error is plus or minus 5.2 percent, which translates roughly into the theoretical possibility of a change of 5.21 points, plus or minus, in any index number.

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the top thirty

This Month	Last Month	Index	
1.	1.	288.15	**1-2-3,** Mitch Kapor and Jonathan Sachs; Lotus Development
2.	2.	124.38	**WordStar;** MicroPro
3.	3.	98.47	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston; VisiCorp, IBM
4.	4.	92.25	**Microsoft Flight Simulator,** Bruce Artwick; Microsoft
5.	5.	76.70	**dBase II,** Wayne Ratcliff; Ashton-Tate
6.	11.	73.59	**Multiplan,** Microsoft; IBM
7.	9.	61.15	**Home Accountant Plus,** Mike Farmer, Bob Schoenburg, Larry Grodin, and Steve Pollack; Continental Software
8.	7.	59.08	**SuperCalc;** Sorcim
9.	19.	49.75	**Volkswriter,** Camilo Wilson; Lifetree
10.	24.	43.53	**Asynchronous Communications Support 2.0;** IBM
11.	6.	40.42	**EasyWriter II,** Basic Software Group; Information Unlimited Software
12.	30.	37.31	**Typing Tutor,** Michael Sierchio (Dick Ainsworth and Al Baker); IBM (Microsoft)
13.	11.	36.28	**FriendlyWare PC Introductory Set,** Michael D. Yaw, James J. Davis, Frank Smith, Alan Vanchura, John Leatherwood, and Bruce W. Moore; FriendlySoft
14.	13.	33.17	**PFS:File,** John Page and D. D. Roberts; IBM (Software Publishing Corporation)
15.	10.	32.13	**PC Man,** Greg Kuperberg; Orion
16.	18.	26.95	**General Ledger,** George Shackelford; State of the Art
17.	14.	25.91	**General Accounting,** John Moss and Ken Debower; IBM (BPI)
18.	14.	23.84	**Zork I;** Infocom
19.	7.	21.77	**EasyWriter 1.1,** John Draper; IBM (Information Unlimited Software)
20.	28.	20.73	**VisiFile,** Creative Computer Applications/ Colin Jameson and Ben Herman; VisiCorp
21.	—	19.69	**The Word Plus,** Wayne Holder; Oasis Systems
	—	19.69	**Basic Compiler,** Microsoft; IBM
23.	19.	17.62	**Deadline;** Infocom
	26.	17.62	**MBA;** Context Management Systems
25.	19.	16.58	**Norton Utilities,** Peter Norton; Peter Norton Inc.
	23.	16.58	**Zork II;** Infocom
	16.	16.58	**TIM III;** Innovative Software
28.	24.	15.55	**General Ledger,** Peachtree; IBM (Peachtree)
29.	26.	12.44	**PC Tutor,** Lora Meise and Rick Lane; Comprehensive Software Support
	—	12.44	**PFS:Report,** John Page; IBM (Software Publishing Corporation)
	—	12.44	**The Instructor,** Jo-L Hendrickson; Individual Software

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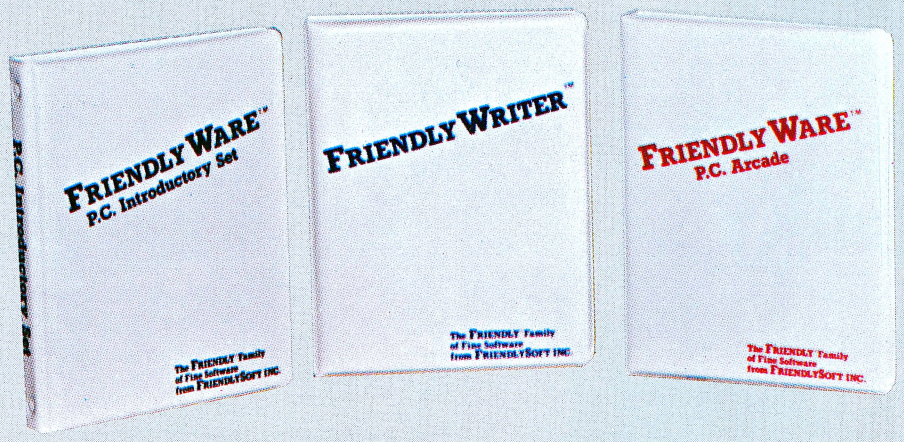

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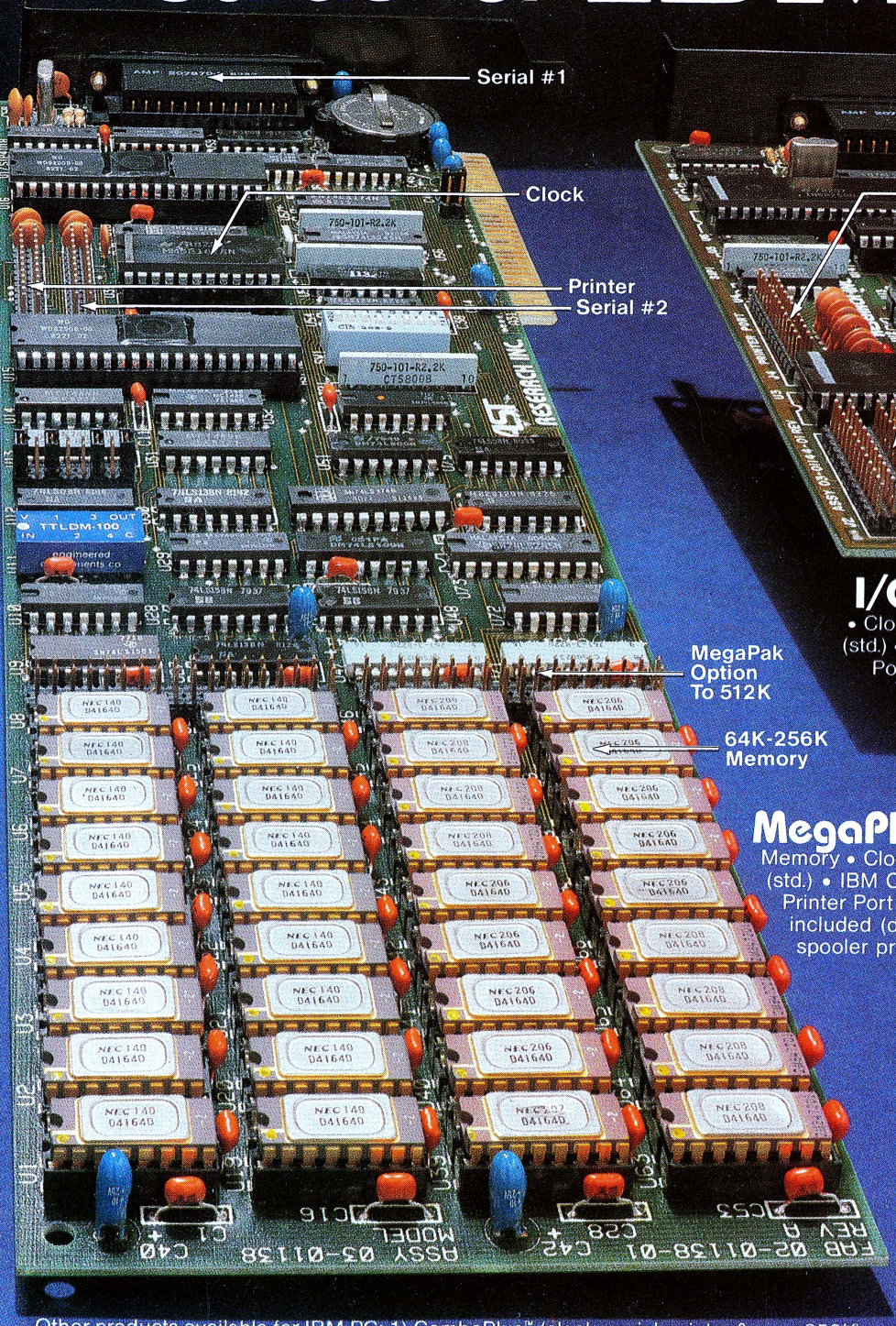

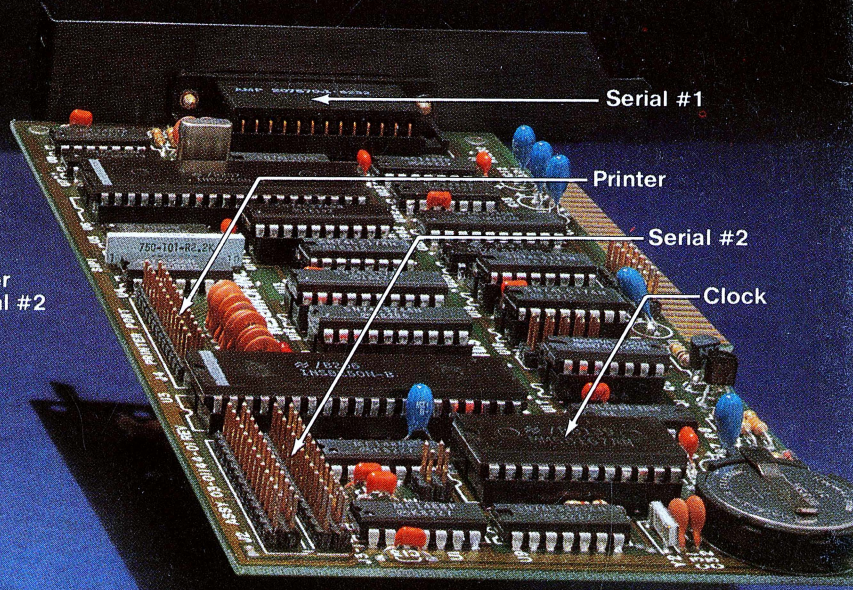

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